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Formation of Certain Summation Formulae Based On Half Argument Involving Hypergeometric Function

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Keywords and Phrases : Gaussian Hypergeometric function , Contiguous function, Recurrence relation, Bailey summation theorem and Legendre duplication formula.

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Formation of Certain Summation Formulae Based On Half Argument Involving Hypergeometric Function

Salahuddin^a, M.P. Chaudhary^Ω

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I. INTRODUCTION

Generalized Gaussian hypergeometric function of one variable is defined by

$${}_A F_B \left[\begin{matrix} a_1, a_2, \dots, a_A ; \\ b_1, b_2, \dots, b_B ; \end{matrix} z \right] = \sum_{k=0}^{\infty} \frac{(a_1)_k (a_2)_k \dots (a_A)_k z^k}{(b_1)_k (b_2)_k \dots (b_B)_k k!}$$

or

$${}_A F_B \left[\begin{matrix} (a_A) ; \\ (b_B) ; \end{matrix} z \right] \equiv {}_A F_B \left[\begin{matrix} (a_j)_{j=1}^A ; \\ (b_j)_{j=1}^B ; \end{matrix} z \right] = \sum_{k=0}^{\infty} \frac{((a_A))_k z^k}{((b_B))_k k!} \quad (1)$$

where the parameters $b_1, b_2, \dots, b_B$ are neither zero nor negative integers and A, B are non-negative integers.

Contiguous Relation is defined as follows

[E. D. p.51(10), Andrews p.363(9.16), H.T. F. I p.103(32)]

$$(a-b) {}_2 F_1 \left[\begin{matrix} a, b ; \\ c ; \end{matrix} z \right] = a {}_2 F_1 \left[\begin{matrix} a+1, b ; \\ c ; \end{matrix} z \right] - b {}_2 F_1 \left[\begin{matrix} a, b+1 ; \\ c ; \end{matrix} z \right] \quad (2)$$

Recurrence relation of gamma function is defined as follows

$$\Gamma(z+1) = z \Gamma(z) \quad (3)$$

Legendre duplication formula is defined by

$$\sqrt{\pi} \Gamma(2z) = 2^{(2z-1)} \Gamma(z) \Gamma\left(z + \frac{1}{2}\right) \quad (4)$$

$$\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi} = \frac{2^{(b-1)} \Gamma\left(\frac{b}{2}\right) \Gamma\left(\frac{b+1}{2}\right)}{\Gamma(b)} \quad (5)$$

$$= \frac{2^{(a-1)} \Gamma\left(\frac{a}{2}\right) \Gamma\left(\frac{a+1}{2}\right)}{\Gamma(a)} \quad (6)$$

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Bailey summation theorem [Prud, p.491(7.3.7.8)] is as follows

$${}_2F_1 \left[\begin{matrix} a, 1-a \\ c \end{matrix} ; \frac{1}{2} \right] = \frac{\Gamma(\frac{c}{2}) \Gamma(\frac{c+1}{2})}{\Gamma(\frac{c+a}{2}) \Gamma(\frac{c+1-a}{2})} = \frac{\sqrt{\pi} \Gamma(c)}{2^{c-1} \Gamma(\frac{c+a}{2}) \Gamma(\frac{c+1-a}{2})} \quad (7)$$

II. MAIN SUMMATION FORMULAE

$$\begin{aligned} {}_2F_1 \left[\begin{matrix} a, -a-31 \\ c \end{matrix} ; \frac{1}{2} \right] &= \frac{\sqrt{\pi} \Gamma(c)}{2^{c+31}} \times \left[\frac{-32(-12677700308232960000)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \right. \\ &+ \frac{-32(20595415066908998400a - 9262043913632837760a^2 + 1353632653931095440a^3)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(607680617478480a^4 - 9943659978649320a^5 - 60453402240a^6 + 30640832998545a^7)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(619328526465a^8 - 25924502835a^9 - 1063654515a^{10} - 7639485a^{11} + 177555a^{12})}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(3255a^{13} + 15a^{14} - 29613493215932774400c + 33134042027396309760ac)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(-10603056513800294784a^2c + 960201585296727696a^3c + 43315347582256032a^4c)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(-5992698426224288a^5c - 188476928122316a^6c + 10666764589703a^7c)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(481387701731a^8c + 46976811a^9c - 259248801a^{10}c - 4024699a^{11}c - 7063a^{12}c + 217a^{13}c)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(a^{14}c - 26872039716804311040c^2 + 21983015579619352320ac^2)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(-5031540460374658560a^2c^2 + 241130543916718800a^3c^2 + 26151340987189080a^4c^2)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(-1146075534278100a^5c^2 - 79796202137550a^6c^2 + 575648038980a^7c^2)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(90737193330a^8c^2 + 1232147700a^9c^2 - 12029850a^{10}c^2 - 351540a^{11}c^2 - 1890a^{12}c^2)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(-13353246626464806912c^3 + 8172439523536586496ac^3 - 1318114175517939968a^2c^3)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\ &+ \frac{-32(18114113175242640a^3c^3 + 6479375107986424a^4c^3 - 45595957626180a^5c^3)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \end{aligned}$$

$$\begin{aligned}
& + \frac{-32(-12824288708390a^6c^3 - 151650421356a^7c^3 + 6139102074a^8c^3 + 144561060a^9c^3)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(488670a^{10}c^3 - 7812a^{11}c^3 - 42a^{12}c^3 - 4190669522667264000c^4)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(1930407148471353600ac^4 - 211801780361313600a^2c^4 - 3250016105076000a^3c^4)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(851154873246000a^4c^4 + 12547796499000a^5c^4 - 966225468600a^6c^4 - 23689890000a^7c^4)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(81396000a^8c^4 + 5859000a^9c^4 + 37800a^{10}c^4 - 896210914300549120c^5)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(309362639107541248ac^5 - 21618987240208448a^2c^5 - 933498687245280a^3c^5)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(62914564722480a^4c^5 + 2025497521320a^5c^5 - 30196918248a^6c^5 - 1347049200a^7c^5)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-7230720a^8c^5 + 78120a^9c^5 + 504a^{10}c^5 - 136593860006123520c^6)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(34887267441143040ac^6 - 1362835188496320a^2c^6 - 106325086633920a^3c^6)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(2400525998640a^4c^6 + 136185033600a^5c^6 + 221205600a^6c^6 - 34372800a^7c^6 - 277200a^8c^6)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-15241536890804224c^7 + 2820561599829248ac^7 - 43480775233984a^2c^7)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-7026484960704a^3c^7 + 17197768368a^4c^7 + 4832488320a^5c^7 + 40122720a^6c^7)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-327360a^7c^7 - 2640a^8c^7 - 1263644981913600c^8 + 164287692771840ac^8)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(393170595840a^2c^8 - 288230659200a^3c^8 - 2365545600a^4c^8 + 88387200a^5c^8 + 950400a^6c^8)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-78243922831360c^9 + 6836145744384ac^9 + 105021238784a^2c^9 - 7241857920a^3c^9)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-99890560a^4c^9 + 654720a^5c^9 + 7040a^6c^9 - 3603584624640c^{10} + 198178506240ac^{10})}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(4809742080a^2c^{10} - 102136320a^3c^{10} - 1647360a^4c^{10} - 121639970816c^{11})}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{-32(3800915456ac^{11} + 113015552a^2c^{11} - 619008a^3c^{11} - 9984a^4c^{11} - 2921318400c^{12})}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-32(43330560ac^{12} + 1397760a^2c^{12} - 47237120c^{13} + 222208ac^{13})}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{7168a^2c^{13} - 460800c^{14} - 2048c^{15})}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-1404104659786692864000a + 1284759281770644960000a^2 - 337819624060585057920a^3}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{18689473291318197264a^4 + 2598574261842425664a^5 - 139074162017438648a^6}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-12587721485125192a^7 + 121255987903953a^8 + 26000045157472a^9 + 505712970236a^{10}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-7770554736a^{11} - 386509018a^{12} - 4298336a^{13} - 588a^{14} + 248a^{15} + a^{16}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{1404104661094367232000c - 3614329675417131417600ac + 1966512596168155299840a^2c}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-325604775785387212800a^3c + 1975242488770713600a^4c + 2446330738917135360a^5c}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-6678286574092800a^6c - 7792114119087360a^7c - 150815024474880a^8c + 6741116040960a^9c}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{271264492800a^{10}c + 1925710080a^{11}c - 45615360a^{12}c - 833280a^{13}c - 3840a^{14}c}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{2329570397985649459200c^2 - 3283817028961948139520ac^2 + 1194870967556528406528a^2c^2}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-120317614621028904960a^3c^2 - 4733771239917818880a^4c^2 + 760630552772864512a^5c^2}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{22492609658218240a^6c^2 - 1384355235709312a^7c^2 - 60829664672896a^8c^2 + 12467452032a^9c^2}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{33246245760a^{10}c^2 + 514161536a^{11}c^2 + 898688a^{12}c^2 - 27776a^{13}c^2 - 128a^{14}c^2}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{1655124063020195512320c^3 - 1566694133878481879040ac^3 + 394025913314442362880a^2c^3}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-21068644278648238080a^3c^3 - 2087759536719206400a^4c^3 + 99858900085632000a^5c^3}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{6644244654451200a^6c^3 - 53144508533760a^7c^3 - 7728849999360a^8c^3 - 104143334400a^9c^3}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{1032998400a^10c^3 + 29998080a^11c^3 + 161280a^12c^3 + 678738473873018191872c^4}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-459933281420468649984ac^4 + 79793531879829762048a^2c^4 - 1351162026922451968a^3c^4}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-401277002343037440a^4c^4 + 3345201060691200a^5c^4 + 814270582363520a^6c^4}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{9418598671104a^7c^4 - 394442326656a^8c^4 - 9235242240a^9c^4 - 31167360a^{10}c^4 + 499968a^{11}c^4}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{2688a^{12}c^4 + 181651168683255398400c^5 - 90177345987803873280ac^5}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{10494783795613040640a^2c^5 + 139662056679137280a^3c^5 - 42960664547573760a^4c^5}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-607731642685440a^5c^5 + 49525783050240a^6c^5 + 1204122931200a^7c^5 - 4238438400a^8c^5}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-299980800a^9c^5 - 1935360a^{10}c^5 + 33878974059312578560c^6 - 12374104894953684992ac^6}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{909163672031133696a^2c^6 + 37748850841710592a^3c^6 - 2678968046424064a^4c^6}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-84979566959616a^5c^6 + 1300367502336a^6c^6 + 57376327680a^7c^6 + 307722240a^8c^6}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-3333120a^9c^6 - 21504a^{10}c^6 + 4576878391071866880c^7 - 1220508453766103040ac^7}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{49957863590215680a^2c^7 + 3790443636080640a^3c^7 - 88592200519680a^4c^7}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-4950311731200a^5c^7 - 7765401600a^6c^7 + 1257062400a^7c^7 + 10137600a^8c^7}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{458279130417332224c^8 - 87651604127752192ac^8 + 1431156603582464a^2c^8}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{222069695772672a^3c^8 - 588637361664a^4c^8 - 154388213760a^5c^8 - 1281223680a^6c^8}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{10475520a^7c^8 + 84480a^8c^8 + 34425286950912000c^9 - 4588800697958400ac^9}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-9140546764800a^2c^9 + 8154982809600a^3c^9 + 66583756800a^4c^9 - 2514124800a^5c^9}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{-27033600a^6c^9 + 1946357837332480c^{10} - 173223332806656ac^{10} - 2635562975232a^2c^{10}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{185101041664a^3c^{10} + 2552512512a^4c^{10} - 16760832a^5c^{10} - 180224a^6c^{10} + 82374536724480c^{11}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-4589969080320ac^{11} - 111220162560a^2c^{11} + 2376990720a^3c^{11} + 38338560a^4c^{11}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{2568813019136c^{12} - 80962945024ac^{12} - 2407022592a^2c^{12} + 13205504a^3c^{12} + 212992a^4c^{12}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{57252249600c^{13} - 853278720ac^{13} - 27525120a^2c^{13} + 862453760c^{14} - 4063232ac^{14}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-131072a^2c^{14} + 7864320c^{15} + 32768c^{16}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} \Big] \quad (8) \\
& {}_2F_1 \left[\begin{matrix} a & , & -a-32 & ; & 1 \\ c & & & & 2 \end{matrix} \right] = \frac{\sqrt{\pi} \Gamma(c)}{2^{c+32}} \times \left[\frac{-2808209320881060096000a}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \right. \\
& + \frac{2663360260009726636800a^2 - 761012930360984837760a^3 + 59789981041407736848a^4}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{3838097925675257664a^5 - 412887209956538296a^6 - 17102186004670536a^7}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{788560364968145a^8 + 45162707702112a^9 + 113794887932a^{10} - 29121053808a^{11}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-578885594a^{12} - 1601376a^{13} + 54964a^{14} + 504a^{15} + a^{16} + 2808209322188734464000c}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-7322501051641862553600ac + 4167566365404321792000a^2c - 776053431621780277248a^3c}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{24390885974292556800a^4c + 4620781401217787264a^5c - 135931294749691584a^6c}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-14708322003815968a^7c + 10204810088880a^8c + 18038108416592a^9c + 340115503728a^{10}c}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-2388933680a^{11}c - 124331760a^{12}c - 1064336a^{13}c - 624a^{14}c + 16a^{15}c}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{4659140795971298918400c^2 - 6716801554917910364160ac^2 + 2592439908026046253056a^2c^2}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} +
\end{aligned}$$



$$\begin{aligned}
& + \frac{-311880368223462988800a^3c^2 - 2396216347714062720a^4c^2 + 1716187470827163840a^5c^2}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{9778714817415456a^6c^2 - 3554364976514352a^7c^2 - 72301707344592a^8c^2 + 1718028618768a^9c^2}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{64981523376a^{10}c^2 + 424868976a^{11}c^2 - 4925424a^{12}c^2 - 63504a^{13}c^2 - 144a^{14}c^2}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{3310248126040391024640c^3 - 3233653400134714392576ac^3 + 878636832223843737600a^2c^3}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-63870969022090296320a^3c^3 - 3015311036723040000a^4c^3 + 287807484504014464a^5c^3}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{9078040634562240a^6c^3 - 324341980864352a^7c^3 - 13651181869248a^8c^3 - 29183712096a^9c^3}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{3898762560a^{10}c^3 + 46316256a^{11}c^3 + 68544a^{12}c^3 - 672a^{13}c^3 + 1357476947746036383744c^4}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-958287782560046014464ac^4 + 184144118482689985536a^2c^4 - 6714508274153121024a^3c^4}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-726733557814194304a^4c^4 + 22135776085684800a^5c^4 + 1484330483864800a^6c^4}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-4210855387200a^7c^4 - 991865175840a^8c^4 - 11279822400a^9c^4 + 58507680a^{10}c^4}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{1270080a^{11}c^4 + 3360a^{12}c^4 + 363302337366510796800c^5 - 189842774413099925504ac^5}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{25372391843410427904a^2c^5 - 194628438514915328a^3c^5 - 89972565214118400a^4c^5}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{234507253939200a^5c^5 + 114510461788800a^6c^5 + 1251789931392a^7c^5 - 29856879360a^8c^5}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-543164160a^9c^5 - 1330560a^{10}c^5 + 8064a^{11}c^5 + 67757948118625157120c^6}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-26359483031947591680ac^6 + 2357507403955787776a^2c^6 + 39185303882199552a^3c^6}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-6546878251691008a^4c^6 - 93030581685888a^5c^6 + 4508612110464a^6c^6 + 90807171840a^7c^6}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-135717120a^8c^6 - 9313920a^9c^6 - 29568a^{10}c^6 + 9153756782143733760c^7}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{-2636370051512795136ac^7 + 146795324427079680a^2c^7 + 5842794486121472a^3c^7}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-281415104289792a^4c^7 - 7799366522112a^5c^7 + 72776816640a^6c^7 + 2611361280a^7c^7}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{9630720a^8c^7 - 42240a^9c^7 + 916558260834664448c^8 - 192573448050880512ac^8}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{5772260367971328a^2c^8 + 400944040915968a^3c^8 - 6229949628672a^4c^8 - 296844134400a^5c^8}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-540418560a^6c^8 + 31933440a^7c^8 + 126720a^8c^8 + 68850573901824000c^9}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-10301237301870592ac^9 + 110259836239872a^2c^9 + 16439027585024a^3c^9 - 12727080960a^4c^9}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-5893212160a^5c^9 - 32778240a^6c^9 + 112640a^7c^9 + 3892715674664960c^{10}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-400184633671680ac^{10} - 1303326216192a^2c^{10} + 416212752384a^3c^{10} + 2679998464a^4c^{10}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-55351296a^5c^{10} - 292864a^6c^{10} + 164749073448960c^{11} - 11045373214720ac^{11}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-140164177920a^2c^{11} + 6205681664a^3c^{11} + 56549376a^4c^{11} - 159744a^5c^{11} + 5137626038272c^{12}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-207626625024ac^{12} - 3753078784a^2c^{12} + 46964736a^3c^{12} + 372736a^4c^{12} + 114504499200c^{13}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-2455240704ac^{13} - 47824896a^2c^{13} + 114688a^3c^{13} + 1724907520c^{14} - 15482880ac^{14}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-245760a^2c^{14} + 15728640c^{15} - 32768ac^{15} + 65536c^{16}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{12576278705767096320000 - 20445225825356330342400a + 9195864755379017736960a^2}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-1329189482740943051136a^3 - 8563352792315063280a^4 + 10830374295768680128a^5}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{43378037926115144a^6 - 37003539895830200a^7 - 895956191167279a^8 + 35589243742624a^9}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{1753588267772a^{10} + 15507471728a^{11} - 396897242a^{12} - 9614752a^{13} - 64076a^{14} + 8a^{15}}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{a^{16} + 29782271680068766924800c - 33546394070092637798400ac}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{10792960405203584729088a^2c - 962166602196723529728a^3c - 52449548626336711680a^4c}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{6715396321014319744a^5c + 251120813725404480a^6c - 13441547680072160a^7c}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-716603737262160a^8c - 895551610448a^9c + 485575752816a^{10}c + 9312490544a^{11}c}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{21734160a^{12}c - 935536a^{13}c - 8304a^{14}c - 16a^{15}c + 27604695181979725332480c^2}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-22862910089061767725056ac^2 + 5288948648690303305728a^2c^2}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-244040874762163528704a^3c^2 - 31398576827991196032a^4c^2 + 1318733262810089280a^5c^2}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{108757286188405536a^6c^2 - 653799030000336a^7c^2 - 148338641669328a^8c^2}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-2422115790864a^9c^2 + 26538983856a^{10}c^2 + 1038392208a^{11}c^2 + 8073744a^{12}c^2 - 1008a^{13}c^2}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-144a^{14}c^2 + 14106325924390826409984c^3 - 8795322431435884462080ac^3}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{1441688965310003077120a^2c^3 - 15928747775997494272a^3c^3 - 8101198657656397568a^4c^3}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{42563478517256576a^5c^3 + 18789368090004160a^6c^3 + 268960085532512a^7c^3}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-11412872678592a^8c^3 - 333793055904a^9c^3 - 1474334400a^{10}c^3 + 33678624a^{11}c^3}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{348096a^{12}c^3 + 672a^{13}c^3 + 4584448058532799709184c^4 - 2167091379778698125312ac^4}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{243008864527168564224a^2c^4 + 4773669278157055232a^3c^4 - 1133240400249215104a^4c^4}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-20265188755606080a^5c^4 + 1564711799131360a^6c^4 + 45980788392000a^7c^4}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-170217764640a^8c^4 - 17306520000a^9c^4 - 161478240a^{10}c^4 + 20160a^{11}c^4 + 3360a^{12}c^4}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{1023142651711497175040c^5 - 365576178424323506176ac^5 + 26239200467672383488a^2c^5}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{1320185065373554688a^3c^5 - 90806945140032000a^4c^5 - 3442576884341760a^5c^5}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{55119033062016a^6c^5 + 3105691171968a^7c^5 + 21662403840a^8c^5 - 336779520a^9c^5}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-4169088a^{10}c^5 - 8064a^{11}c^5 + 164179858383692103680c^6 - 43864327113745481728ac^6}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{1761239942758438912a^2c^6 + 160703492904553984a^3c^6 - 3805540868512768a^4c^6}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-262533478306176a^5c^6 - 597701064576a^6c^6 + 101531485440a^7c^6 + 1184198400a^8c^6}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-147840a^9c^6 - 29568a^{10}c^6 + 19490608115873742848c^7 - 3822615444792410112ac^7}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{58965974414561280a^2c^7 + 11765617904499712a^3c^7 - 25099911969792a^4c^7}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-11128976272128a^5c^7 - 119769999360a^6c^7 + 1411238400a^7c^7 + 21795840a^8c^7 + 42240a^9c^7}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{1741265002564026368c^8 - 243941753814798336ac^8 - 917210568772608a^2c^8}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{553288264928256a^3c^8 + 5641747676928a^4c^8 - 261080709120a^5c^8 - 4060193280a^6c^8}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{506880a^7c^8 + 126720a^8c^8 + 118054610869944320c^9 - 11359341010485248ac^9}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-209922369175552a^2c^9 + 16662945181696a^3c^9 + 297528535040a^4c^9 - 2822420480a^5c^9}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-58009600a^6c^9 - 112640a^7c^9 + 6078561478246400c^{10} - 379322169081856ac^{10}}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-11262679633920a^2c^{10} + 301692971008a^3c^{10} + 7037814784a^4c^{10} - 878592a^5c^{10}}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-292864a^6c^{10} + 235981559037952c^{11} - 8739429810176ac^{11} - 336125337600a^2c^{11}}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{2668417024a^3c^{11} + 82108416a^4c^{11} + 159744a^5c^{11} + 6790426918912c^{12} - 127990833152ac^{12}}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} +
\end{aligned}$$



$$\begin{aligned}
& + \frac{-5971603456a^2c^{12} + 745472a^3c^{12} + 372736a^4c^{12} + 140341411840c^{13} - 957874176ac^{13}}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{-58834944a^2c^{13} - 114688a^3c^{13} + 1968701440c^{14} - 245760ac^{14} - 245760a^2c^{14} + 16777216c^{15}}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} + \\
& + \frac{32768ac^{15} + 65536c^{16}}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+33}{2})} \Bigg] \quad (9)
\end{aligned}$$

III. DERIVATIONS OF THE RESULTS(8) TO (9)

Derivation of result (8) : putting $b = -a - 31, z = \frac{1}{2}$ in known result (2), we get

$$\begin{aligned}
& (2a + 31) {}_2F_1 \left[\begin{matrix} a, & -a - 31 \\ c & \end{matrix} ; \frac{1}{2} \right] \\
& = a {}_2F_1 \left[\begin{matrix} a + 1, & -a - 31 \\ c & \end{matrix} ; \frac{1}{2} \right] + (a + 31) {}_2F_1 \left[\begin{matrix} a, & -a - 30 \\ c & \end{matrix} ; \frac{1}{2} \right]
\end{aligned}$$

Now using Bailey theorem, we get

$$\begin{aligned}
L.H.S = a \frac{\sqrt{\pi} \Gamma(c)}{2^{c+30}} \times & \left[\frac{-46803488615967283200(a+1) + 42767159087365735680(a+1)^2}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \right. \\
& + \frac{-11270601192070601856(a+1)^3 + 661015913631944304(a+1)^4}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{76584910384046512(a+1)^5 - 4417245600019672(a+1)^6 - 336434811648432(a+1)^7}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{3976287855967(a+1)^8 + 608379703391(a+1)^9 + 9950104899(a+1)^{10} - 147972013(a+1)^{11}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-5745971(a+1)^{12} - 49203(a+1)^{13} - 7(a+1)^{14} + (a+1)^{15} + 46803488703145574400c}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-118859389113316884480(a+1)c + 64102962284473595904(a+1)^2c}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-10599521603190073344(a+1)^3c + 111032145402626688(a+1)^4c}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{70940427398809792(a+1)^5c - 407139854973664(a+1)^6c - 199425094414192(a+1)^7c}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-3203075817296(a+1)^8c + 144861951696(a+1)^9c + 4812296496(a+1)^{10}c}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{27275696(a+1)^{11}c - 528752(a+1)^{12}c - 6608(a+1)^{13}c - 16(a+1)^{14}c}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{76092230309416796160c^2 - 105466755123938820096(a+1)c^2}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{37807566181098061824(a+1)^2c^2 - 3801519798063379968(a+1)^3c^2}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-122484531131280000(a+1)^4c^2 + 21183090923693504(a+1)^5c^2}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{525072890414880(a+1)^6c^2 - 33174563270480(a+1)^7c^2 - 1230849813984(a+1)^8c^2}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{1027790064(a+1)^9c^2 + 495596640(a+1)^{10}c^2 + 5892880(a+1)^{11}c^2 + 7392(a+1)^{12}c^2}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-112(a+1)^{13}c^2 + 52634394423692623872c^3 - 48739196162194857984(a+1)c^3}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{+11997982874998750208(a+1)^2c^3 - 647120383330003200(a+1)^3c^3}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-54784666314553984(a+1)^4c^3 + 2650005405760320(a+1)^5c^3 + 149770214403680(a+1)^6c^3}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-1262779162176(a+1)^7c^3 - 137968653984(a+1)^8c^3 - 1507947840(a+1)^9c^3}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{12018720(a+1)^{10}c^3 + 237888(a+1)^{11}c^3 + 672(a+1)^{12}c^3 + 20870135981644185600c^4}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-13743447729720811520(a+1)c^4 + 2316611729627405312(a+1)^2c^4}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-42837424766233856(a+1)^3c^4 - 9995837120296320(a+1)^4c^4 + 92690856584640(a+1)^5c^4}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{16695491060640(a+1)^6c^4 + 158053727328(a+1)^7c^4 - 5904024000(a+1)^8c^4}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-105934080(a+1)^9c^4 - 252000(a+1)^{10}c^4 + 2016(a+1)^{11}c^4 + 5359367756720373760c^5}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-2564183483721285632(a+1)c^5 + 287511916583118848(a+1)^2c^5}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{2891094455400960(a+1)^3c^5 - 988409117368320(a+1)^4c^5 - 11460885179520(a+1)^5c^5}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{889877079168(a+1)^6c^5 + 17580998400(a+1)^7c^5 - 50023680(a+1)^8c^5 - 2378880(a+1)^9c^5}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} +
\end{aligned}$$



$$\begin{aligned}
& + \frac{-8064(a+1)^{10}c^5 + 950653543419740160c^6 - 331203488938483712(a+1)c^6}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{23227972384509952(a+1)^2c^6 + 825626374939136(a+1)^3c^6 - 55557808244736(a+1)^4c^6}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-1476433967232(a+1)^5c^6 + 19650247680(a+1)^6c^6 + 658533120(a+1)^7c^6}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{2472960(a+1)^8c^6 - 13440(a+1)^9c^6 + 120874161588404224c^7 - 30349688822075392(a+1)c^7}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{1175475851951104(a+1)^2c^7 + 75957743533056(a+1)^3c^7 - 1613337631488(a+1)^4c^7}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-72595015680(a+1)^5c^7 - 84395520(a+1)^6c^7 + 9968640(a+1)^7c^7 + 42240(a+1)^8c^7}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{11246832294297600c^8 - 1991999707934720(a+1)c^8 + 30885185565696(a+1)^2c^8}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{3902365108224(a+1)^3c^8 - 9744641280(a+1)^4c^8 - 1772770560(a+1)^5c^8}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-10264320(a+1)^6c^8 + 42240(a+1)^7c^8 + 772615155220480c^9 - 93305628573696(a+1)c^9}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-108440735744(a+1)^2c^9 + 119913953280(a+1)^3c^9 + 756828160(a+1)^4c^9}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-19937280(a+1)^5c^9 - 112640(a+1)^6c^9 + 39124756070400c^{10} - 3061463646208(a+1)c^{10}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-37866008576(a+1)^2c^{10} + 2126170112(a+1)^3c^{10} + 20410368(a+1)^4c^{10}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-67584(a+1)^5c^{10} + 1441659355136c^{11} - 67616333824(a+1)c^{11} - 1271508992(a+1)^2c^{11}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{18849792(a+1)^3c^{11} + 159744(a+1)^4c^{11} + 37571788800c^{12} - 930242560(a+1)c^{12}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-19222528(a+1)^2c^{12} + 53248(a+1)^3c^{12} + 656015360c^{13} - 6766592(a+1)c^{13}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-114688(a+1)^2c^{13} + 6881280c^{14} - 16384(a+1)c^{14} + 32768c^{15}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{202843204931727360000 - 322513180299113932800(a+1) + 137081176976279704320(a+1)^2}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{-16958441227372769664(a+1)^3 - 603183214997264496(a+1)^4}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{146759006054821328(a+1)^5 + 4133871935431448(a+1)^6 - 410385710727888(a+1)^7}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-19216954885103(a+1)^8 + 76930919809(a+1)^9 + 18767187789(a+1)^{10}}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{359027053(a+1)^{11} + 584899(a+1)^{12} - 48237(a+1)^{13} - 457(a+1)^{14} - (a+1)^{15}}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{473815891454924390400c - 514267672818039828480(a+1)c}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{152733916790608472064(a+1)^2c - 10431151935471012096(a+1)^3c}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-1042530101607866112(a+1)^4c + 70205646306447488(a+1)^5c}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{4867596553619456(a+1)^6c - 72498049647248(a+1)^7c - 9301873967216(a+1)^8c}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-143461234896(a+1)^9c + 2457464016(a+1)^{10}c + 89007184(a+1)^{11}c + 737968(a+1)^{12}c}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-112(a+1)^{13}c - 16(a+1)^{14}c + 429952635468868976640c^2}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-338004961381278756864(a+1)c^2 + 70059026697492178944(a+1)^2c^2}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-1759276041319756032(a+1)^3c^2 - 479277775728825600(a+1)^4c^2}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{7123495031408896(a+1)^5c^2 + 1469730527666880(a+1)^6c^2 + 17407942640720(a+1)^7c^2}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-1222948011264(a+1)^8c^2 - 35273078064(a+1)^9c^2 - 145104960(a+1)^{10}c^2}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{4630640(a+1)^{11}c^2 + 51072(a+1)^{12}c^2 + 112(a+1)^{13}c^2 + 213651946023436910592c^3}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-124357165551965761536(a+1)c^3 + 17532687851337924608(a+1)^2c^3}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} + \\
& + \frac{190507604230245120(a+1)^3c^3 - 101519794853401984(a+1)^4c^3}{\Gamma(\frac{c+a+32}{2}) \Gamma(\frac{c-a-1}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{-1414918873379520(a+1)^5c^3 + 184536822383840(a+1)^6c^3 + 5294045822016(a+1)^7c^3}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-34417217184(a+1)^8c^3 - 2670212160(a+1)^9c^3 - 26567520(a+1)^{10}c^3}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{4032(a+1)^{11}c^3 + 672(a+1)^{12}c^3 + 67050712362676224000c^4}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-29026509985070018560(a+1)c^4 + 2631784500033124352(a+1)^2c^4}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{117050823745715456(a+1)^3c^4 - 11408656870312320(a+1)^4c^4}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-412101963368640(a+1)^5c^4 + 9483271361760(a+1)^6c^4 + 501887904672(a+1)^7c^4}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{3510897600(a+1)^8c^4 - 69457920(a+1)^9c^4 - 917280(a+1)^{10}c^4 - 2016(a+1)^{11}c^4}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{14339374628808785920c^5 - 4586744602902335488(a+1)c^5 + 238537086089704448(a+1)^2c^5}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{20197806522800640(a+1)^3c^5 - 657184891672320(a+1)^4c^5 - 42870132090240(a+1)^5c^5}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-39115880832(a+1)^6c^5 + 21361670400(a+1)^7c^5 + 265681920(a+1)^8c^5 - 40320(a+1)^9c^5}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-8064(a+1)^{10}c^5 + 2185501760097976320c^6 - 508452565484474368(a+1)c^6}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{11307303767053312(a+1)^2c^6 + 1925277943980544(a+1)^3c^6 - 9760743879936(a+1)^4c^6}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-2321995498368(a+1)^5c^6 - 25841195520(a+1)^6c^6 + 370433280(a+1)^7c^6}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{6101760(a+1)^8c^6 + 13440(a+1)^9c^6 + 243864590252867584c^7 - 40222844632813568(a+1)c^7}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-22289722459136(a+1)^2c^7 + 113092549008384(a+1)^3c^7 + 1111218400512(a+1)^4c^7}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-67136593920(a+1)^5c^7 - 1113361920(a+1)^6c^7 + 168960(a+1)^7c^7 + 42240(a+1)^8c^7}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{20218319710617600c^8 - 2276064016568320(a+1)c^8 - 40567245886464(a+1)^2c^8}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{4142976178176((a+1)^3c^8 + 77685822720(a+1)^4c^8 - 873143040(a+1)^5c^8}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-19134720(a+1)^6c^8 - 42240(a+1)^7c^8 + 1251902765301760c^9 - 90907976146944(a+1)c^9}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-2799334866944(a+1)^2c^9 + 89515345920(a+1)^3c^9 + 2226780160(a+1)^4c^9}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-337920(a+1)^5c^9 - 112640(a+1)^6c^9 + 57657353994240c^{10}}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-2473121226752(a+1)c^{10} - 100757651456(a+1)^2c^{10} + 931330048(a+1)^3c^{10}}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{30547968(a+1)^4c^{10} + 67584(a+1)^5c^{10} + 1946239533056c^{11} - 42316292096(a+1)c^{11}}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-2105372672(a+1)^2c^{11} + 319488(a+1)^3c^{11} + 159744(a+1)^4c^{11} + 46741094400c^{12}}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-366878720(a+1)c^{12} - 24014848(a+1)^2c^{12} - 53248(a+1)^3c^{12} + 755793920c^{13}}{\Gamma(\frac{c+a+32}{2})\Gamma(\frac{c-a-1}{2})} + \\
& + \frac{-114688(a+1)c^{13} - 114688(a+1)^2c^{13} + 7372800c^{14} + 16384(a+1)c^{14} + 32768c^{15}}{\Gamma(\frac{c-a-1}{2})\Gamma(\frac{c+a+32}{2})} \Bigg] + \\
& (a+31) \frac{\sqrt{\pi} \Gamma(c)}{2^{c+30}} \times \left[\frac{-46803488615967283200a + 42767159087365735680a^2}{\Gamma(\frac{c-a+1}{2})\Gamma(\frac{c+a+30}{2})} + \right. \\
& + \frac{-11270601192070601856a^3 + 661015913631944304a^4 + 76584910384046512a^5}{\Gamma(\frac{c-a-1}{2})\Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-4417245600019672a^6 - 336434811648432a^7 + 3976287855967a^8 + 608379703391a^9}{\Gamma(\frac{c-a-1}{2})\Gamma(\frac{c+a+30}{2})} + \\
& + \frac{9950104899a^{10} - 147972013a^{11} - 5745971a^{12} - 49203a^{13} - 7a^{14} + a^{15}}{\Gamma(\frac{c-a-1}{2})\Gamma(\frac{c+a+30}{2})} + \\
& + \frac{46803488703145574400c - 118859389113316884480ac + 64102962284473595904a^2c}{\Gamma(\frac{c-a-1}{2})\Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-10599521603190073344a^3c + 111032145402626688a^4c + 70940427398809792a^5c}{\Gamma(\frac{c-a-1}{2})\Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-407139854973664a^6c - 199425094414192a^7c - 3203075817296a^8c + 144861951696a^9c}{\Gamma(\frac{c-a-1}{2})\Gamma(\frac{c+a+30}{2})} + \\
& + \frac{4812296496a^{10}c + 27275696a^{11}c - 528752a^{12}c - 6608a^{13}c - 16a^{14}c}{\Gamma(\frac{c-a-1}{2})\Gamma(\frac{c+a+30}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{76092230309416796160c^2 - 105466755123938820096ac^2 + 37807566181098061824a^2c^2}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-3801519798063379968a^3c^2 - 122484531131280000a^4c^2 + 21183090923693504a^5c^2}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{525072890414880a^6c^2 - 33174563270480a^7c^2 - 1230849813984a^8c^2 + 1027790064a^9c^2}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{495596640a^{10}c^2 + 5892880a^{11}c^2 + 7392a^{12}c^2 - 112a^{13}c^2 + 52634394423692623872c^3}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-48739196162194857984ac^3 + 11997982874998750208a^2c^3 - 647120383330003200a^3c^3}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-54784666314553984a^4c^3 + 2650005405760320a^5c^3 + 149770214403680a^6c^3}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-1262779162176a^7c^3 - 137968653984a^8c^3 - 1507947840a^9c^3 + 12018720a^{10}c^3 + 237888a^{11}c^3}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{672a^12c^3 + 20870135981644185600c^4 - 13743447729720811520ac^4}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{672a^12c^3 + 20870135981644185600c^4 - 13743447729720811520ac^4}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{2316611729627405312a^2c^4 - 42837424766233856a^3c^4 - 9995837120296320a^4c^4}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{92690856584640a^5c^4 + 16695491060640a^6c^4 + 158053727328a^7c^4 - 5904024000a^8c^4}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-105934080a^9c^4 - 252000a^{10}c^4 + 2016a^{11}c^4 + 5359367756720373760c^5}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-2564183483721285632ac^5 + 287511916583118848a^2c^5 + 2891094455400960a^3c^5}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-988409117368320a^4c^5 - 11460885179520a^5c^5 + 889877079168a^6c^5 + 17580998400a^7c^5}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-50023680a^8c^5 - 2378880a^9c^5 - 8064a^{10}c^5 + 950653543419740160c^6}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-331203488938483712ac^6 + 23227972384509952a^2c^6 + 825626374939136a^3c^6}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-55557808244736a^4c^6 - 1476433967232a^5c^6 + 19650247680a^6c^6 + 658533120a^7c^6}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{+2472960a^8c^6 - 13440a^9c^6 + 120874161588404224c^7 - 30349688822075392ac^7}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{1175475851951104a^2c^7 + 75957743533056a^3c^7 - 1613337631488a^4c^7 - 72595015680a^5c^7}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-84395520a^6c^7 + 9968640a^7c^7 + 42240a^8c^7 + 11246832294297600c^8 - 1991999707934720ac^8}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{30885185565696a^2c^8 + 3902365108224a^3c^8 - 9744641280a^4c^8 - 1772770560a^5c^8}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-10264320a^6c^8 + 42240a^7c^8 + 772615155220480c^9 - 93305628573696ac^9}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-108440735744a^2c^9 + 119913953280a^3c^9 + 756828160a^4c^9 - 19937280a^5c^9 - 112640a^6c^9}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{39124756070400c^{10} - 3061463646208ac^{10} - 37866008576a^2c^{10} + 2126170112a^3c^{10}}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{20410368a^4c^{10} - 67584a^5c^{10} + 1441659355136c^{11} - 67616333824ac^{11} - 1271508992a^2c^{11}}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{18849792a^3c^{11} + 159744a^4c^{11} + 37571788800c^{12} - 930242560ac^{12} - 19222528a^2c^{12}}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{53248a^3c^{12} + 656015360c^{13} - 6766592ac^{13} - 114688a^2c^{13} + 6881280c^{14}}{\Gamma(\frac{c-a-1}{2}) \Gamma(\frac{c+a+30}{2})} + \\
& + \frac{-16384ac^{14} + 32768c^{15}}{\Gamma(\frac{c+a+30}{2}) \Gamma(\frac{c-a+1}{2})} + \\
& + \frac{202843204931727360000 - 322513180299113932800a + 137081176976279704320a^2}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-16958441227372769664a^3 - 603183214997264496a^4 + 146759006054821328a^5}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{4133871935431448a^6 - 410385710727888a^7 - 19216954885103a^8 + 76930919809a^9}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{18767187789a^{10} + 359027053a^{11} + 584899a^{12} - 48237a^{13} - 457a^{14} - a^{15}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{473815891454924390400c - 514267672818039828480ac + 152733916790608472064a^2c}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-10431151935471012096a^3c - 1042530101607866112a^4c + 70205646306447488a^5c}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{4867596553619456a^6c - 72498049647248a^7c - 9301873967216a^8c - 143461234896a^9c}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{2457464016a^{10}c + 89007184a^{11}c + 737968a^{12}c - 112a^{13}c - 16a^{14}c}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{429952635468868976640c^2 - 338004961381278756864ac^2 + 70059026697492178944a^2c^2}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{-1759276041319756032a^3c^2 - 479277775728825600a^4c^2 + 7123495031408896a^5c^2}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{1469730527666880a^6c^2 + 17407942640720a^7c^2 - 1222948011264a^8c^2 - 35273078064a^9c^2}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{-145104960a^{10}c^2 + 4630640a^{11}c^2 + 51072a^{12}c^2 + 112a^{13}c^2 + 213651946023436910592c^3}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{-124357165551965761536ac^3 + 17532687851337924608a^2c^3 + 190507604230245120a^3c^3}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{-101519794853401984a^4c^3 - 1414918873379520a^5c^3 + 184536822383840a^6c^3}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{5294045822016a^7c^3 - 34417217184a^8c^3 - 2670212160a^9c^3 - 26567520a^{10}c^3 + 4032a^{11}c^3}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{672a^{12}c^3 + 67050712362676224000c^4 - 29026509985070018560ac^4}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{2631784500033124352a^2c^4 + 117050823745715456a^3c^4 - 11408656870312320a^4c^4}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{-412101963368640a^5c^4 + 9483271361760a^6c^4 + 501887904672a^7c^4 + 3510897600a^8c^4}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{-69457920a^9c^4 - 917280a^{10}c^4 - 2016a^{11}c^4 + 14339374628808785920c^5}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{-4586744602902335488ac^5 + 238537086089704448a^2c^5 + 20197806522800640a^3c^5}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{-657184891672320a^4c^5 - 42870132090240a^5c^5 - 39115880832a^6c^5 + 21361670400a^7c^5}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{265681920a^8c^5 - 40320a^9c^5 - 8064a^{10}c^5 + 2185501760097976320c^6}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} + \\
& + \frac{-508452565484474368ac^6 + 11307303767053312a^2c^6 + 1925277943980544a^3c^6}{\Gamma\left(\frac{c+a+31}{2}\right)\Gamma\left(\frac{c-a}{2}\right)} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{-9760743879936a^4c^6 - 2321995498368a^5c^6 - 25841195520a^6c^6 + 370433280a^7c^6}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{6101760a^8c^6 + 13440a^9c^6 + 243864590252867584c^7 - 40222844632813568ac^7}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-22289722459136a^2c^7 + 113092549008384a^3c^7 + 1111218400512a^4c^7 - 67136593920a^5c^7}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-1113361920a^6c^7 + 168960a^7c^7 + 42240a^8c^7 + 20218319710617600c^8 - 2276064016568320ac^8}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-40567245886464a^2c^8 + 4142976178176a^3c^8 + 77685822720a^4c^8 - 873143040a^5c^8}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-19134720a^6c^8 - 42240a^7c^8 + 1251902765301760c^9 - 90907976146944ac^9}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-2799334866944a^2c^9 + 89515345920a^3c^9 + 2226780160a^4c^9 - 337920a^5c^9 - 112640a^6c^9}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{57657353994240c^{10} - 2473121226752ac^{10} - 100757651456a^2c^{10} + 931330048a^3c^{10}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{30547968a^4c^{10} + 67584a^5c^{10} + 1946239533056c^{11} - 42316292096ac^{11} - 2105372672a^2c^{11}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{319488a^3c^{11} + 159744a^4c^{11} + 46741094400c^{12} - 366878720ac^{12} - 24014848a^2c^{12}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{-53248a^3c^{12} + 755793920c^{13} - 114688ac^{13} - 114688a^2c^{13} + 7372800c^{14}}{\Gamma(\frac{c+a+31}{2}) \Gamma(\frac{c-a}{2})} + \\
& + \frac{16384ac^{14} + 32768c^{15}}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} \Big]
\end{aligned}$$

On simplification , we get

$$\begin{aligned}
{}_2F_1 \left[\begin{matrix} a & , & -a-31 & ; & 1 \\ & c & & ; & 2 \end{matrix} \right] &= \frac{\sqrt{\pi} \Gamma(c)}{2^{c+31}} \times \left[\frac{-32(-12677700308232960000)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \right. \\
& + \frac{-32(20595415066908998400a - 9262043913632837760a^2 + 1353632653931095440a^3)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(607680617478480a^4 - 9943659978649320a^5 - 60453402240a^6 + 30640832998545a^7)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \left. \frac{-32(619328526465a^8 - 25924502835a^9 - 1063654515a^{10} - 7639485a^{11} + 177555a^{12})}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} \right]
\end{aligned}$$

$$\begin{aligned}
& + \frac{-32(3255a^{13} + 15a^{14} - 29613493215932774400c + 33134042027396309760ac)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-10603056513800294784a^2c + 960201585296727696a^3c + 43315347582256032a^4c)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-5992698426224288a^5c - 188476928122316a^6c + 10666764589703a^7c)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(481387701731a^8c + 46976811a^9c - 259248801a^{10}c - 4024699a^{11}c - 7063a^{12}c + 217a^{13}c)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(a^{14}c - 26872039716804311040c^2 + 21983015579619352320ac^2)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-5031540460374658560a^2c^2 + 241130543916718800a^3c^2 + 26151340987189080a^4c^2)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-1146075534278100a^5c^2 - 79796202137550a^6c^2 + 575648038980a^7c^2)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(90737193330a^8c^2 + 1232147700a^9c^2 - 12029850a^{10}c^2 - 351540a^{11}c^2 - 1890a^{12}c^2)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-13353246626464806912c^3 + 8172439523536586496ac^3 - 1318114175517939968a^2c^3)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(18114113175242640a^3c^3 + 6479375107986424a^4c^3 - 45595957626180a^5c^3)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-12824288708390a^6c^3 - 151650421356a^7c^3 + 6139102074a^8c^3 + 144561060a^9c^3)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(488670a^{10}c^3 - 7812a^{11}c^3 - 42a^{12}c^3 - 4190669522667264000c^4)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(1930407148471353600ac^4 - 211801780361313600a^2c^4 - 3250016105076000a^3c^4)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(851154873246000a^4c^4 + 12547796499000a^5c^4 - 966225468600a^6c^4 - 23689890000a^7c^4)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(81396000a^8c^4 + 5859000a^9c^4 + 37800a^{10}c^4 - 896210914300549120c^5)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(309362639107541248ac^5 - 21618987240208448a^2c^5 - 933498687245280a^3c^5)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(62914564722480a^4c^5 + 2025497521320a^5c^5 - 30196918248a^6c^5 - 1347049200a^7c^5)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{-32(-7230720a^8c^5 + 78120a^9c^5 + 504a^{10}c^5 - 136593860006123520c^6)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(34887267441143040ac^6 - 1362835188496320a^2c^6 - 106325086633920a^3c^6)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(2400525998640a^4c^6 + 136185033600a^5c^6 + 221205600a^6c^6 - 34372800a^7c^6 - 277200a^8c^6)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-15241536890804224c^7 + 2820561599829248ac^7 - 43480775233984a^2c^7)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-7026484960704a^3c^7 + 17197768368a^4c^7 + 4832488320a^5c^7 + 40122720a^6c^7)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-327360a^7c^7 - 2640a^8c^7 - 1263644981913600c^8 + 164287692771840ac^8)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(393170595840a^2c^8 - 288230659200a^3c^8 - 2365545600a^4c^8 + 88387200a^5c^8 + 950400a^6c^8)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-78243922831360c^9 + 6836145744384ac^9 + 105021238784a^2c^9 - 7241857920a^3c^9)}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-99890560a^4c^9 + 654720a^5c^9 + 7040a^6c^9 - 3603584624640c^{10} + 198178506240ac^{10})}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(4809742080a^2c^{10} - 102136320a^3c^{10} - 1647360a^4c^{10} - 121639970816c^{11})}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(3800915456ac^{11} + 113015552a^2c^{11} - 619008a^3c^{11} - 9984a^4c^{11} - 2921318400c^{12})}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-32(-32(43330560ac^{12} + 1397760a^2c^{12} - 47237120c^{13} + 222208ac^{13})}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{7168a^2c^{13} - 460800c^{14} - 2048c^{15}}{\Gamma(\frac{c-a}{2}) \Gamma(\frac{c+a+31}{2})} + \\
& + \frac{-1404104659786692864000a + 1284759281770644960000a^2 - 337819624060585057920a^3}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{18689473291318197264a^4 + 2598574261842425664a^5 - 139074162017438648a^6}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-12587721485125192a^7 + 121255987903953a^8 + 26000045157472a^9 + 505712970236a^{10}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-7770554736a^{11} - 386509018a^{12} - 4298336a^{13} - 588a^{14} + 248a^{15} + a^{16}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} +
\end{aligned}$$



$$\begin{aligned}
& + \frac{1404104661094367232000c - 3614329675417131417600ac + 1966512596168155299840a^2c}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{-325604775785387212800a^3c + 1975242488770713600a^4c + 2446330738917135360a^5c}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{-6678286574092800a^6c - 7792114119087360a^7c - 150815024474880a^8c + 6741116040960a^9c}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{271264492800a^{10}c + 1925710080a^{11}c - 45615360a^{12}c - 833280a^{13}c - 3840a^{14}c}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{2329570397985649459200c^2 - 3283817028961948139520ac^2 + 1194870967556528406528a^2c^2}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{-120317614621028904960a^3c^2 - 4733771239917818880a^4c^2 + 760630552772864512a^5c^2}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{22492609658218240a^6c^2 - 1384355235709312a^7c^2 - 60829664672896a^8c^2 + 12467452032a^9c^2}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{33246245760a^{10}c^2 + 514161536a^{11}c^2 + 898688a^{12}c^2 - 27776a^{13}c^2 - 128a^{14}c^2}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{1655124063020195512320c^3 - 1566694133878481879040ac^3 + 394025913314442362880a^2c^3}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{-21068644278648238080a^3c^3 - 2087759536719206400a^4c^3 + 99858900085632000a^5c^3}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{6644244654451200a^6c^3 - 53144508533760a^7c^3 - 7728849999360a^8c^3 - 10414334400a^9c^3}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{1032998400a^{10}c^3 + 29998080a^{11}c^3 + 161280a^{12}c^3 + 678738473873018191872c^4}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{-459933281420468649984ac^4 + 79793531879829762048a^2c^4 - 1351162026922451968a^3c^4}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{-401277002343037440a^4c^4 + 3345201060691200a^5c^4 + 814270582363520a^6c^4}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{9418598671104a^7c^4 - 394442326656a^8c^4 - 9235242240a^9c^4 - 31167360a^{10}c^4 + 499968a^{11}c^4}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{2688a^{12}c^4 + 181651168683255398400c^5 - 90177345987803873280ac^5}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} + \\
& + \frac{10494783795613040640a^2c^5 + 139662056679137280a^3c^5 - 42960664547573760a^4c^5}{\Gamma\left(\frac{c-a+1}{2}\right)\Gamma\left(\frac{c+a+32}{2}\right)} +
\end{aligned}$$

$$\begin{aligned}
& + \frac{-607731642685440a^5c^5 + 49525783050240a^6c^5 + 1204122931200a^7c^5 - 4238438400a^8c^5}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-299980800a^9c^5 - 1935360a^{10}c^5 + 33878974059312578560c^6 - 12374104894953684992ac^6}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{909163672031133696a^2c^6 + 37748850841710592a^3c^6 - 2678968046424064a^4c^6}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-84979566959616a^5c^6 + 1300367502336a^6c^6 + 57376327680a^7c^6 + 307722240a^8c^6}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-3333120a^9c^6 - 21504a^{10}c^6 + 4576878391071866880c^7 - 1220508453766103040ac^7}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{49957863590215680a^2c^7 + 3790443636080640a^3c^7 - 88592200519680a^4c^7}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-4950311731200a^5c^7 - 7765401600a^6c^7 + 1257062400a^7c^7 + 10137600a^8c^7}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{458279130417332224c^8 - 87651604127752192ac^8 + 1431156603582464a^2c^8}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{222069695772672a^3c^8 - 588637361664a^4c^8 - 154388213760a^5c^8 - 1281223680a^6c^8}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{10475520a^7c^8 + 84480a^8c^8 + 34425286950912000c^9 - 4588800697958400ac^9}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-9140546764800a^2c^9 + 8154982809600a^3c^9 + 66583756800a^4c^9 - 2514124800a^5c^9}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-27033600a^6c^9 + 1946357837332480c^{10} - 173223332806656ac^{10} - 2635562975232a^2c^{10}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{185101041664a^3c^{10} + 2552512512a^4c^{10} - 16760832a^5c^{10} - 180224a^6c^{10} + 82374536724480c^{11}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{-4589969080320ac^{11} - 111220162560a^2c^{11} + 2376990720a^3c^{11} + 38338560a^4c^{11}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{2568813019136c^{12} - 80962945024ac^{12} - 2407022592a^2c^{12} + 13205504a^3c^{12} + 212992a^4c^{12}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{57252249600c^{13} - 853278720ac^{13} - 27525120a^2c^{13} + 862453760c^{14} - 4063232ac^{14}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} + \\
& + \frac{\phantom{57252249600c^{13} - 853278720ac^{13} - 27525120a^2c^{13} + 862453760c^{14} - 4063232ac^{14}}}{\Gamma(\frac{c-a+1}{2}) \Gamma(\frac{c+a+32}{2})} +
\end{aligned}$$

$$+ \frac{-131072a^2c^{14} + 7864320c^{15} + 32768c^{16}}{\Gamma\left(\frac{c-a+1}{2}\right) \Gamma\left(\frac{c+a+32}{2}\right)} \Bigg]$$

Thus , we prove the result (8).

Similarly, we can prove the result(9).

REFERENCES RÉFÉRENCES REFERENCIAS

1. Arora, Asish, Singh, Rahul , Salahuddin. ; Development of a family of summation formulae of half argument using Gauss and Bailey theorems *Journal of Rajasthan Academy of Physical Sciences.*, 7(2008), 335 - 342.
2. Choi, J., Harsh, H. and Rathie, A. K.; Some summation formulae for the Apple's function F_1 , *East Asian Math. Journal*, 17(2001), 233 - 237.
3. Erdélyi, A., Magnus, W., Okerhettinger, F. and Tricomi, F. G.; *Higher transcendental functions* Vol.1 (Bateman Manuscript Project) McGraw-Hill book P. Inc. New York, Toronto and London, 1953.
4. Krupnikov, E. D., K"olbig, K. S.; Some special cases of the generalized hypergeometric function ${}_{q+1}F_q$, *Journal of computational and Applied Math.*, 78(1997), 79 - 95.
5. Lavoie, J. L.; Notes on a paper by J. B. Miller, *J. Austral. Math. Soc. Ser. B*, 29(1987), 216 - 220.
6. Lavoie, J. L.; Some summation formulae for the series ${}_3F_2$, *Math. Comput.*, 49(1987), 269 - 274.
7. Lavoie, J. L., Grondin, F. and Rathie, A.K.; Generalizations of Watson's theorem on the sum of a ${}_3F_2$, *Indian J. Math.*, 34(1992), 23 - 32.
8. Lavoie, J. L., Grondin, F. and Rathie, A.K.; Generalizations of Whipple's theorem on the sum of a ${}_3F_2$, *J. Comput. Appl. Math.*, 72(1996), 293 - 300.
9. Lavoie, J. L., Grondin, F. Rathie, A. K. and Arora, K.; Generalizations of Dixon's theorem on the sum of a ${}_3F_2$, *Math. Comput.*, 62, 267 - 276.
10. Mitra, C. S.; *J. Indian Math. Soc.* (N.S.), 7(1943), 102 - 109.
11. Prudnikov, A. P., Brychkov, Yu. A. and Marichev, O.I.; *Integrals and Series Vol. 3: More Special Functions*. Nauka, Moscow, 1986. Translated from the Russian by G.G. Gould, Gordon and Breach Science Publishers, New York, Philadelphia, London, Paris, Montreux, Tokyo, Melbourne, 1990.
12. Rainville, E. D.; The contiguous function relations for ${}_pF_q$ with applications to Bateman's $J_n^{u,v}$ and Rice's $H_n(\zeta, p, \nu)$, *Bull. Amer. Math. Soc.*, 51(1945), 714 - 723.
13. Salahuddin, Chaudhary, M.P ; Development of Some Summation Formulae Using Hypergeometric Function, *Global Journal of Science Frontier Research*, 10(2010), 36 - 48.(U.S.A)
14. Shashikant, Sharma, S. and Rathie, A. K.; Some summation formulae for the Apple's function F_1 , *Proc. of the fourth Int. Conf. SSFA*, 4(2003), 81 - 84.



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