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CONSTRUCTION OF A SUMMATION FORMULA COVERED WITH HYPERGEOMETRIC FUNCTION

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ABSTRACT

The main aim of the present paper is to construct a summation formula of half argument covering Hypergeometric function.

***Key words**: Gaussian Hypergeometric function, Recurrence relation, Bailey summation theorem, Contiguous relation.*

***2010 MSC NO:** 33C05, 33C20, 33C45, 33D50, 33D60.*

I. INTRODUCTION

Generalized Gaussian Hypergeometric function of one variable is defined by

$$ {}_AF_B(a_1,a_2,\ldots,a_A;b_1,b_2,\ldots b_B;z) = \sum_{k=0}^{\infty}\frac{(a_1)_k(a_2)_k\ldots\ldots(a_A)_k\, z^k}{(b_1)_k(b_2)_k\ldots\ldots(b_B)_k\, k!} = \sum_{k=0}^{\infty}\left[\prod_{h=1}^{A}(a_h)_k z^k \Big/ \prod_{h=1}^{B}(b_h)_k k!\right] \tag{1}$$

where the parameters b_1 , b_2 , ….,b_B are neither zero nor negative integers and A , B are non negative integers.

Luke [5,P.156, Eq. 3,4] describes that the series ${}_AF_B$ converges for all finite z if $A \leq B$, converges for $|z| < 1$ if $A=B+1$, diverges for all z, $z \neq 0$ if $A > B+1$ and absolutely converges for $|z| = 1$ if $R(\eta) < 0$, conditionally converges for $|z| = 1$, $z \neq 0$ if $0 \leq R(\eta) < 1$, diverges for $|z| = 1$, $1 \leq R(\eta)$, $\eta = \sum_{h=1}^{A} a_h - \sum_{h=1}^{B} b_h$.

Gauss' Relations for Contiguous Functions

The six functions ${}_2F_1$ (a+1,b;c;z), ${}_2F_1$ (a-1,b;c;z), ${}_2F_1$ (a,b+1;c;z), ${}_2F_1$ (a,b-1;c;z), ${}_2F_1$ (a,b;c+1;z), ${}_2F_1$ (a,b;c-1;z) are called contiguous to ${}_2F_1$ (a, b ;c ;z) and any two contiguous functions have given by Gauss. Here we use the contiguous relation which is defined by [Andrews's p.363 (9.16)]

$$(a-b)\, {}_2F_1(a, b ; c; z) = a\, {}_2F_1(a+1,b; c; z) - b\, {}_2F_1(a,b+1; c; z) \tag{2}$$

Recurrence relation of Gamma Function

The Gamma function generalizes the factorial function to non-integral, negative and complex arguments, follows the recurrence relation

$$\Gamma(\xi+1) = \xi\, \Gamma(\xi) \tag{3}$$

Bailey summation theorem [Prudnikov, p. 491(7.3.7.8)]

$$ {}_2F_1\left(a, 1-a ; c; \tfrac{1}{2}\right) = \frac{\Gamma\left(\frac{c}{2}\right)\Gamma\left(\frac{c+1}{2}\right)}{\Gamma\left(\frac{c+a}{2}\right)\Gamma\left(\frac{c+1-a}{2}\right)} = \frac{\sqrt{\pi}\,\Gamma(c)}{2^{c-1}\Gamma\left(\frac{c+a}{2}\right)\Gamma\left(\frac{c+1-a}{2}\right)} \tag{4}$$

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II MAIN SUMMATION FORMULA

$$ {}_2F_1\left(a, -a-43 ; c; \tfrac{1}{2}\right) = \frac{\sqrt{\pi}\,\Gamma(\mathbf{c})}{2^{c+43}} \Bigg[\frac{5500020387296256135136542720000 0}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-9890453271025051778152312012800 0\ a + 5606015750024563758691798548480 0\ a^2}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-1344324240156922455015325762560 0\ a^3 + 129605789819050178623650514022 4\ a^4}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-25015944580277056820217619 20\ a^5 - 6265035809046416560617412800\ a^6}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{1068145245998389260956284 80\ a^7 + 15771884652260150862475104\ a^8 - 90526285401940417269\ 240 a^9}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-227114184653659322019 00\ a^{10} - 248339615158413618840\ a^{11} + 12573859476017884044\ a^{12}}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{334279954572804240\ a^{13} + 508436446749000\ a^{14} - 78453932301360\ a^{15} - 1068323860296\ a^{16}}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-2709325080\ a^{17} + 47100900\ a^{18} + 397320\ a^{19} + 924 a^{20} + 13772400049551843605305412812800 0\ c}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-1818423725891232318282920853504 00\ a\,c + 797821432028389682775498453811 20\ a^2 c}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-146519864352949374497846979809 28\ a^3 c + 941309283707092469617988815872\ a^4 c}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{3053360153737274814831435840 0\ a^5 c - 4654094317159744326623000000\ a^6 c}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-44498741821466629535688256\ a^7 c + 957613606553690596041392 0\ a^8 c + 151260279028273995464040\ a^9 c}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-855566318848302591270 0\ a^{10} c - 24469853318458063058 4\ a^{11} c + 1115143052805226588\ a^{12} c}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{113724999047351120\ a^{13} c + 1256858704641320\ a^{14} c - 5363207287152\ a^{15} c - 201985328424\ a^{16} c}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-1330511160\ a^{17} c - 861740\ a^{18} c + 18920\ a^{19} c + 44 a^{20} c + 13883524767162129135650167848960 0\ c^2}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-1426313993602416287478307946496 00\ ac^2 + 493748019215895468947646906040 32\ a^2 c^2}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-690007592017596391437897931161 6\ a^3 c^2 + 254740890342423099369546860544\ a^4 c^2}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{2182811273675135163913705574 4\ a^5 c^2 - 1267555583226277661228236800\ a^6 c^2}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-45836097126671539298677248\ a^7 c^2 + 1910011380764564856385152\ a^8 c^2 + 744060965222525768737 92\ a^9 c^2}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$ + \frac{-6901493749223679365 76\ a^{10} c^2 - 55201503246617984256\ a^{11} c^2 - 4780282079567\ 55456 a^{12} c^2}{\Gamma\left(\frac{\mathbf{c+a+43}}{\mathbf{2}}\right)\Gamma\left(\frac{\mathbf{c-a}}{\mathbf{2}}\right)} $$

$$+\frac{9856586516160384\ a^{13}c^{2}+210417251071104\ a^{14}c^{2}+933390501120\ a^{15}c^{2}-7742528640\ a^{16}c^{2}-85821120\ a^{17}c^{2}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-221760\ a^{18}c^{2}+7907425634570668625950830231\ \ 5520\ c^{3}-6494959583831116561796800472678\ 4\ ac^{3}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{1786688441992651677881673734553 6\ a^{2}c^{3}-1863485168356230545486067499008\ a^{3}c^{3}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{231501280008916059206240030 72\ a^{4}c^{3}+6590136197714494175234558976\ a^{5}c^{3}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-1450593697425902937912668 16\ a^{6}c^{3}-124798300857852454684400 64\ a^{7}c^{3}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{1102086996366\ 01135979136\ a^{8}c^{3}+13050455903507843510976\ a^{9}c^{3}+91079993506097747008\ a^{10}c^{3}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-4867441897079993088\ a^{11}c^{3}-90393429649622528\ a^{12}c^{3}-27192030273408\ a^{13}c^{3}+11684985282432\ a^{14}c^{3}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{98119422720\ a^{15}c^{3}+119264640\ a^{16}c^{3}-1362240\ a^{17}c^{3}-3520\ a^{18}c^{3}+2935237867855676752429322757734 4\ c^{4}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-1953695086507070348348039351500 8\ ac^{4}+4268803751215527905349713805312\ a^{2}c^{4}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-3202743905315586644490633953 28\ a^{3}c^{4}-3665009510803059471649809408\ a^{4}c^{4}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{112058102478856708929011712 0\ a^{5}c^{4}+190673821260744042923520\ a^{6}c^{4}-170645436527629437454080 0\ a^{7}c^{4}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-14121662403253741976640\ a^{8}c^{4}+110505231973759214592 0\ a^{9}c^{4}+20506803743813587200\ a^{10}c^{4}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-133663300415124480\ a^{11}c^{4}-6117405347813760\ a^{12}c^{4}-40846581135360\ a^{13}c^{4}+184123779840\ a^{14}c^{4}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{2975132160\ a^{15}c^{4}+8648640\ a^{16}c^{4}+767969365050230227966336853606 4\ c^{5}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-416685599980680962973782074982 4\ ac^{5}+718470761075046120897022672896\ a^{2}c^{5}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-\ 3623360432939900905506630041 6\ a^{3}c^{5}-1396119876193383415296852992\ a^{4}c^{5}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{117509575402132015947120640\ a^{5}c^{5}+2142622102667148683875840\ a^{6}c^{5}-131132172129269667259904\ a^{7}c^{5}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-2943073599239995597376\ a^{8}c^{5}+41885886943130081280\ a^{9}c^{5}+1577146733768136960\ a^{10}c^{5}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{6556064565033984\ a^{11}c^{5}-180033965215104\ a^{12}c^{5}-2021767587840\ a^{13}c^{5}-3670867200\ a^{14}c^{5}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{6556064565033984\ a^{11}c^{5}-180033965215104\ a^{12}c^{5}-2021767587840\ a^{13}c^{5}-3670867200\ a^{14}c^{5}+28334592\ a^{15}c^{5}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{82368\ a^{16}c^{5}+1486885997910414897836898385920\ c^{6}-658353661049783505846392586240\ ac^{6}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{8847598352185954778779523481 6\ a^2c^6-26022359929506429014252912 64\ a^3c^6}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-208851110718787667040927744\ a^4c^6+75917133163512067988520 96\ a^5c^6}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{2961126746965978923171 84\ a^6c^6-522707458927924016947 2\ a^7c^6-234615293772587599872\ a^8c^6}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-2346126600794296 32\ a^9c^6+60773040813348864\ a^{10}c^6+597859551184896\ a^{11}c^6-1304574695424\ a^{12}c^6}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-38875060224\ a^{13}c^6-129153024\ a^{14}c^6+22004267851607090829297975296 0\ c^7}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-7930364040060944723367742668 8\ ac^7+8147605399322312297858596864\ a^2c^7}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-9002650432164353839002419 2\ a^3c^7-193206418296079795814072 32\ a^4c^7}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{25329148322856852355481 6\ a^5c^7+21789344727107355926528\ a^6c^7-2216751592969282969 6\ a^7c^7}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-1037059034344277401 6\ a^8c^7-91402058615003136\ a^9c^7+1098993678182400\ a^{10}c^7+180620934574\ 08a^{11}c^7}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{45369612288\ a^{12}c^7-264456192\ a^{13}c^7-878592\ a^{14}c^7+2545122773351129464093173350 4\ c^8}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-742405127503816998600022425 6\ ac^8+56652207572258505459508838 4\ a^2c^8}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{3162168614945071675367424\ a^3c^8-1216281597553409181290496\ a^4c^8-21340455683549267865 60\ a^5c^8}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{100010689528178677248 0\ a^6c^8+8805194559743662080\ a^7c^8-258536018843182080\ a^8c^8}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-3954843180288000\ a^9c^8+1306705720320\ a^{10}c^8+249911101440\ a^{11}c^8+968647680\ a^{12}c^8}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{233655736426853439520532070 4\ c^9-546891920455218145559052288\ ac^9}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{29664167018036795266793472\ a^2c^9+6441508804343147327569 92\ a^3c^9-533819061176918637486 08\ a^4c^9}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-700628072918644316160\ a^5c^9+28934045538191805440\ a^6c^9+486376185642547200\ a^7c^9}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-2822915527111680\ a^8c^9-83125192550400\ a^9c^9-282388986880\ a^{10}c^9+1322280960\ a^{11}c^9+5125120\ a^{12}c^9}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{172026599854267056563159040\ c^{10}-31928656992019503340584960\ ac^{10}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{1145681551388169029025792\ a^2c^{10}+454596385362616713216 00\ a^3c^{10}-16029912466195198771 20\ a^4c^{10}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-38512220108566364160\ a^5c^{10}+472015055354658816\ a^6c^{10}+13388422645678080\ a^7c^{10}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{20526720614400\ a^8c^{10}-888572805120\ a^9c^{10}-4132896768\ a^{10}c^{10}+1022058601234021880954880\ c^{11}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-14811122978214128721592 32\ ac^{11}+30687116883181344129024\ a^2c^{11}+2030313878280026193920\ a^3c^{11}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-29984826969773178880\ a^4c^{11}-1205757023031328768\ a^5c^{11}+1704629010366464\ a^6c^{11}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{211762414223360\ a^7c^{11}+983068835840\ a^8c^{11}-3846635520\ a^9c^{11}-17891328\ a^{10}c^{11}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{4913210429626229446410 24\ c^{12}-544856999118683127152 64\ ac^{12}+4542598491670653173 76\ a^2c^{12}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{6318688291102890393 6\ a^3c^{12}-210083716474404864\ a^4c^{12}-23997066439557120\ a^5c^{12}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-94168679055360\ a^6c^{12}+1830998507520\ a^7c^{12}+10645340160\ a^8c^{12}+1909424549052012717670 4\ c^{13}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-1578608797837297713152\ ac^{13}-25293520258263941 12\ a^2c^{13}+1396809178146930688\ a^3c^{13}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{5150068304969728\ a^4c^{13}-300860553297920\ a^5c^{13}-1995786813440\ a^6c^{13}+6706954240\ a^7c^{13}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{38993920\ a^8c^{13}+597187695048665333760\ c^{14}-35555545284933058560\ ac^{14}-333627741972725760\ a^2c^{14}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{21602321600348160\ a^3c^{14}+173322047324160\ a^4c^{14}-2173053173760\ a^5c^{14}-16845373440\ a^6c^{14}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{14897218521074237440\ c^{15}-609263062075047936\ ac^{15}-9288999034159104\ a^2c^{15}+222720703856640\ a^3c^{15}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{2342576455680\ a^4c^{15}-6898581504\ a^5c^{15}-53477376\ a^6c^{15}+292085168879960064\ c^{16}-7669018535657472\ ac^{16}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-148759527555072\ a^2c^{16}+1376267010048\ a^3c^{16}+16003104768\ a^4c^{16}+4399065647284224\ c^{17}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-66817699086336\ ac^{17}-1471015550976\ a^2c^{17}+3855089664\ a^3c^{17}+44826624\ a^4c^{17}+49084555591680\ c^{18}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{-359808368640\ ac^{18}-8367636480\ a^2c^{18}+381975265280\ c^{19}-901775360\ ac^{19}-20971520\ a^2c^{19}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}$$

$$+\frac{1849688064\ c^{20}+4194304\ c^{21}}{\Gamma\left(\frac{c+a+43}{2}\right)\Gamma\left(\frac{c-a}{2}\right)}+\frac{-224700339967251832541449912320000\ a}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{245675511386457925311251306496000\ a^2-92398129958442574109189861222400\ a^3}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{14218476528411964637209996116480\ a^4-5729912933711060421489867598 08\ a^5}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-595878594321882475315063661 76\ a^6+3897112358932793247050709840\ a^7}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{168644876499184974681214400\ a^8-8250973338962635703948768\ a^9-387814272297048845972086\ a^{10}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{4509551660473761452265\ a^{11}+4415097089080797111055\ a^{12}+4780484180704133187\ a^{13}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-134659725858225601\ a^{14}-3858188827649750\ a^{15}-24102283757530\ a^{16}+316240181862\ a^{17}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{5912253864\ a^{18}+31296045\ a^{19}+1595\,a^{20}-473\,a^{21}-a^{22}+224700339967302923483621621760000\ \ c}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-655232181517747866670056308736000\ \ a\,c+456149094864292449739393092403200\ \ a^{2}c}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-124176951389566444564951545968640\ \ a^{3}c+13307052664001331228972166594560\ \ a^{4}c}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-1019250776672783271038496856\,32\ \ a^{5}c-642714268676585248002570184\,32\ \ a^{6}c}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{133435134739812060629483116\,8\ \ a^{7}c+166418650521524343330008544\ \ a^{8}c}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-12629354493365263179686\,16\ \ a^{9}c-2471907738649652546803\,56\ \ a^{10}c-2530026077939025401736\ \ a^{11}c}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{140033842925274253956\ \ a^{12}c+3640729635215360688\ \ a^{13}c+4822218259580568\ \ a^{14}c}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-866400414807312\ \ a^{15}c-11723128795224\ \ a^{16}c-29487898440\ a^{17}c+518923020\ a^{18}c+4370520\ a^{19}c}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{10164\,a^{20}c+40955667013147618616958517\,2480000\ \ c^{2}-69210021452853060517409269\,6780800\ \ ac^{2}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{349303530835626176153019494522880\ \ a^{2}c^{2}-70796377827614941172340289145856\ \ a^{3}c^{2}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{5033034309591897443116168347648\ \ a^{4}c^{2}+1331824155122787178532756376\,96\ \ a^{5}c^{2}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-247734214701095108618186251\,8\ \ 4a^{6}c^{2}-17778541471925867873485168\,0\ \ a^{7}c^{2}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{520254192754600823614615\,52\ \ a^{8}c^{2}+7606967225992320418054\,68\ \ a^{9}c^{2}-4753691002892961750964\,2\ \ a^{10}c^{2}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-1318987891894145782452\ \ a^{11}c^{2}+6628137641256382394\ \ a^{12}c^{2}+625611119939484536\ \ a^{13}c^{2}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{6848408396944796\ a^{14}c^{2}-30036933277032\ a^{15}c^{2}-1111574204796\ a^{16}c^{2}-7310319060\ a^{17}c^{2}-4720210\ a^{18}c^{2}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{104060\,a^{19}c^{2}+242\,a^{20}c^{2}+32834924962297936144675268198400\,0\ \ c^{3}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-395527008077928659633052851896320\ \ ac^{3}+151922995437760145562071988633600\ \ a^{2}c^{3}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-23018807147459562312830602297344\ \ a^{3}c^{3}+9557482546768445979738696130\,56\ \ a^{4}c^{3}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{720139432351890239524149135\,36\ \ a^{5}c^{3}-4641652765127565234822061056\ \ a^{6}c^{3}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-155687168173727968575942144\ a^7c^3+710095133893343957440281 6\ a^8c^3}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{26471321331569418233529 6\ a^9c^3-2679371297934607628352\ a^{10}c^3-201410007181490435328\ a^{11}c^3}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-1707942754178588928\ a^{12}c^3+36439361027701632\ a^{13}c^3+770176364614272\ a^{14}c^3}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{3400614201600\ a^{15}c^3-28452695040\ a^{16}c^3-314677440\ a^{17}c^3-813120\ a^{18}c^3}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{156181952103741056723676718694400\ c^4-143796368316267601202163357057024\ ac^4}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{429039160074388738141197118341 12\ a^2c^4-47966984707066979315288620769 28\ a^3c^4}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{7561088643058183496543484723 2\ a^4c^4+1705731474525119534715217740 8\ a^5c^4}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-417585124505220519081194752\ a^6c^4-33118648556797758779913088\ a^7c^4}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{329587252699285055226752\ a^8c^4+35500722626114601030032\ a^9c^4+2360622631075164250 08\ a^{10}c^4}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-13444751637349471296\ a^{11}c^4-246929584084570816\ a^{12}c^4-56257092187296\ a^{13}c^4+32167319679264\ a^{14}c^4}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{269568678720\ a^{15}c^4+327222720\ a^{16}c^4-3746160\ a^{17}c^4-9680\ a^{18}c^4+499356893356738366051291748106 24\ c^5}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-3625166444431174744786824\ \ 8162304\ ac^5+8458069376926190965727847038976\ a^2c^5}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-6757822332845265787249517936 64\ a^3c^5-585197753647357187840853504 0\ a^4c^5}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{2381642085760347471156\ \ 006912\ a^5c^5-27662054456642974106618 88\ a^6c^5}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-3696078097165487651025408\ a^7c^5-285054830786185924464 00\ a^8c^5+2433412227293672841216\ a^9c^5}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{44446561514663083776\ a^{10}c^5-3006177556984842 24\ a^{11}c^5-13443871830060672\ a^{12}c^5}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-89434852835328\ a^{13}c^5+406492998912\ a^{14}c^5+6545290752\ a^{15}c^5+19027008\ a^{16}c^5}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{11495034211923642459797871132672\ c^6-6678640289893676181807051767808\ ac^6}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{1215794840838801077151362424832\ a^2c^6-652060057600068704349644513 28\ a^3c^6}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-2317321846106654676359307776\ a^4c^6+212109621420365124480088064\ a^5c^6}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{3651627516465868438763264\ a^6c^6-240072332402704153800448\ a^7c^6-5262851227877714607136\ a^8c^6}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{77954829728450701312\ a^9c^6+2877301507208915072\ a^{10}c^6+117877973784130 56\ a^{11}c^6}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-330643960430784\ a^{12}c^6-3703180056576\ a^{13}c^6-6718647936\ a^{14}c^6+51946752\ a^{15}c^6+151008\ a^{16}c^6}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{19887130280227251467314633113 60\ c^7-93047130781411867831453089792 0\ ac^7}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{130900146047791470656009797632\ a^2c^7-41287402524146483817545 07264\ a^3c^7}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-3106022092371655487440650 24\ a^4c^7+1195525501369009486285209 6\ a^5c^7}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{450724574405553662742528\ a^6c^7-834105931565165100441 6\ a^7c^7-36488617602120\ 3572736\ a^8c^7}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-310809510835439616\ a^9c^7+95480691223357440\ a^{10}c^7+935828217612288\ a^{11}c^7-2064252782592\ a^{12}c^7}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-61089380352\ a^{13}c^7-202954752\ a^{14}c^7+26610429584803018056128266240 0\ c^8}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-10032696148932439355163017216 0\ ac^8+1072000478235121252468906393 6\ a^2c^8}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-1339898625148947680043335 68\ a^3c^8-2569144811453641756872908 8\ a^4c^8}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{359581880994808446301184\ a^5c^8+294833051510472112901 12\ a^6c^8-3846072413601855923 2\ a^7c^8}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-1421277558702909107 2\ a^8c^8-124307079443619072\ a^9c^8+1515771937295616\ a^{10}c^8+24813560868096\ a^{11}c^8}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{62298652416\ a^{12}c^8-363627264\ a^{13}c^8-1208064\ a^{14}c^8+2808875449706141276501861990 4\ c^9}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-8503673241003770008624693248\ ac^9+6715417491045004664205803 52\ a^2c^9}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{304916894789008450159411 2\ a^3c^9-1457238474737788654399488\ a^4c^9-190898394613574968320 0\ a^5c^9}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{1213672766975955686400\ a^6c^9+105169669986501120 00\ a^7c^9-316361785151892480\ a^8c^9}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-4817406718924800\ a^9c^9+1672854543360\ a^{10}c^9+305446901760\ a^{11}c^9+1183902720\ a^{12}c^9}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{2370986094814654160628088832\ c^{10}-572286480082233987111714816\ ac^{10}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{32010873666551002323369984\ a^2c^{10}+6681321715789909789286 40\ a^3c^{10}-58113531500527307577344\ a^4c^{10}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-7464851500318674176 00\ a^5c^{10}+317923413213013836 80\ a^6c^{10}+530745723862402048\ a^7c^{10}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-3125017989277184\ a^8c^{10}-91360137989120\ a^9c^{10}-310267077120\ a^{10}c^{10}+1454509056\ a^{11}c^{10}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{5637632\, a^{12}c^{10}+161493068510163124113899520\, c^{11}-30746490249624\ 773575311360\, ac^{11}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{1135533741503176356397056\, a^{2}c^{11}+44079602007404863291392\, a^{3}c^{11}-1598288629529412108288\, a^{4}c^{11}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-37985299752468676608\, a^{5}c^{11}+474078\ 897258430464\, a^{6}c^{11}+13348140678512640\, a^{7}c^{11}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{20292523130880\, a^{8}c^{11}-888572805120\, a^{9}c^{11}-4132896768\, a^{10}c^{11}+8922416281267433845555200\, c^{12}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-1320417403717902145683456\, ac^{12}+28184740654144484540416\, a^{2}c^{12}+1827960422114424193024\, a^{3}c^{12}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-27607467564831604736\, a^{4}c^{12}-1098110789455167488\, a^{5}c^{12}+1610111618891776\, a^{6}c^{12}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{193955697295360\, a^{7}c^{12}+900217077760\, a^{8}c^{12}-3526082560\, a^{9}c^{12}-16400384\, a^{10}c^{12}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{400614148064193275756544\, c^{13}-45196195336582874529792\, ac^{13}+392830116084896759808\, a^{2}c^{13}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{52912353491122126848\, a^{3}c^{13}-182200243025805312\, a^{4}c^{13}-20249435032780800\, a^{5}c^{13}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-79248825384960\, a^{6}c^{13}+1549306429440\, a^{7}c^{13}+9007595520\, a^{8}c^{13}+14596774850597037801472\, c^{14}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-1223639031008336543744\, ac^{14}-1733183593128525824\, a^{2}c^{14}+1091371470539063296\, a^{3}c^{14}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{3982100505788416\, a^{4}c^{14}-2362007237\ 42720\, a^{5}c^{14}-1566647582720\, a^{6}c^{14}+5269749760\, a^{7}c^{14}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{30638080\, a^{8}c^{14}+429421135150322810880\, c^{15}-25849485456561930240\, ac^{15}-240305493893971968\, a^{2}c^{15}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{1580\ 1332007960576\, a^{3}c^{15}+126633410297856\, a^{4}c^{15}-1593572327424\, a^{5}c^{15}-12353273856\, a^{6}c^{15}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{10105208294919372800\, c^{16}-416786991624486912\, ac^{16}-6340366263779328\, a^{2}c^{16}+153000333606912\, a^{3}c^{16}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{1609124216832\, a^{4}c^{16}-4742774784\, a^{5}c^{16}-36765696\, a^{6}c^{16}+187379201504968704\, c^{17}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-4950432435142656\, ac^{17}-95980032884736\, a^{2}c^{17}+890525712384\, a^{3}c^{17}+10354950144\, a^{4}c^{17}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{2675019582799872\, c^{18}-40801626488832\, ac^{18}-898223439872\, a^{2}c^{18}+2355888128\, a^{3}c^{18}+27394048\, a^{4}c^{18}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{28349552394240\, c^{19}-208310108160\, ac^{19}-4844421120\, a^{2}c^{19}+209924915200\, c^{20}-495976448\, ac^{20}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}$$

$$+\frac{-11534336\, a^{2}c^{20}+968884224\, c^{21}+2097152\, c^{22}}{\Gamma\left(\frac{c+a+44}{2}\right)\Gamma\left(\frac{c-a+1}{2}\right)}\ ] \tag{5}$$

III.EVALUATION OF MAIN FORMULA

Substituting b= -a-43, z= $\frac{1}{2}$ in known result (2), we get

$(2a+43)\ {}_2F_1\ (a, -a-43; c;\frac{1}{2}) = a\ {}_2F_1\ (a+1,-a-43; c;\frac{1}{2}) + (a+43)\ {}_2F_1\ (a,-a-42; c;\frac{1}{2})$

Now involving the result obtained in Salahuddin *et al* [6, P.2609, Eq. 5], the main formula is evaluated.

IV. CONCLUSION

In this paper we have constructed a summation formula involving contiguous relation of Gamma function and Hypergeometric function. But the formula prescribed herein may be further developed to extend this result .Thus we can only hope that the development presented in this work will stimulate further interest and research in this important area of special functions. Just as the mathematical properties of the Gauss hypergeometric function are already of immense and significant utility in mathematical sciences and numerous other areas of pure and applied mathematics, the elucidation and discovery of the formula of hypergeometric functions considered herein should certainly eventually prove useful to further developments in the broad areas associated to above.

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