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Multiparametric Rational Solutions of Order N to the KPI Equation and the Explicit Case of Order 3

P. Gaillard[1*]

[1] *Université de Bourgogne Franche Comté, Institut de Mathématiques de Bourgogne, 9 Avenue Alain Savary BP 47870 21078 Dijon Cedex, France.*

Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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Abstract

We present multiparametric rational solutions to the Kadomtsev-Petviashvili equation (KPI). These solutions of order N depend on $2N-2$ real parameters.
Explicit expressions of the solutions at order 3 are given. They can be expressed as a quotient of a polynomial of degree $2N(N+1)-2$ in x, y and t by a polynomial of degree $2N(N+1)$ in x, y and t, depending on $2N-2$ real parameters. We study the patterns of their modulus in the (x,y) plane for different values of time t and parameters.

Keywords: Multiparametric rational solution; Kadomtsev-Petviashvili equation; spatial dimensions; Riemann-Hilbert problem.

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Corresponding author: E-mail: Pierre.Gaillard@u-bourgogne.fr;

1 INTRODUCTION

The Kadomtsev-Petviashvili equation (KPI) is a well-known nonlinear partial differential equation [1],[2] in two spatial and one temporal coordinates which can be written in the following form:

$$(4u_t - 6uu_x + u_{xxx})_x = 3u_{yy}, \tag{1.1}$$

with subscripts x, y and t denoting partial derivatives.

The KP equation first appeared in 1970, in a paper written by Kadomtsev and Petviashvili [3]. The discovery of the KP equation happened almost simultaneously with the development of the inverse scattering transform (IST) as it is explained in Manakov et al. [4]. In 1974 Dryuma showed how the KP equation could be written in Lax form [5], and Zakharov extended the IST to equations in two spatial dimensions, including the KP equation, and obtained several exact solutions to the KP equation.

In 1981 Dubrovin constructed for the first time [6] the solutions to KPI given in terms of Riemann theta functions in the frame of algebraic geometry.

From the 1980's, a lot of methods have been found to solve that equation. We can quote the nonlocal Riemann-Hilbert problem, the d-bar problem or inverse scattering problem using integration in the complex plane. More details can be found in the book by Ablowitz and Clarkson published in 1991 [7].

We can cite in particular the works of Krichever [8], Satsuma and Ablowitz in 1979 [9], Matveev in 1979 [10], Freeman and Nimmo in 1983 [11, 12], Pelinovsky and Stepanyants in 1993 [13], Pelinovsky in 1994 [14], Ablowitz and Villarroel [15, 16] in 1997-1999, Biondini and Kodama [17, 18, 19] in 2003-2007.

This paper is part of a program of research of rational solutions of partial differential equations. New solutions of the KPI equation are presented here. We express rational solutions in terms of a quotient of a polynomial of degree $2N(N+1)-2$ in x, y and t by a polynomial of degree $2N(N+1)$ in x, y and t depending on $2N-2$ real parameters. This representation allows to obtain an infinite hierarchy of solutions to the KPI equation, depending on $2N-2$ real parameters.

That provides an effective method to construct an infinite hierarchy of rational solutions of order N depending on $2N-2$ real parameters. We present here only the rational solutions of order 3, depending on 4 real parameters, and the representations of their modulus in the plane of the coordinates (x, y) according to real parameters a_1, b_1, a_2, b_2 and time t.

2 RATIONAL SOLUTIONS OF ORDER N TO THE KPI EQUATION DEPENDING ON $2N-2$ REAL PARAMETERS

We consider the matrix M defined by:

$$\begin{aligned} m_{ij} = & \sum_{k=0}^{i} c_{i-k} \left(\frac{\sqrt{p^2-4}}{3} \partial_p \right)^k \sum_{l=0}^{j} c_{j-l} \left(\frac{\sqrt{q^2-4}}{3} \partial_q \right)^l \\ & \times \left(\frac{1}{p+q} \exp\left(\frac{1}{2}(p+q)(-x+\frac{3}{4}t) - \frac{1}{4}(p^2-q^2)iy) \right) \right)_{p=q=-1}. \end{aligned} \tag{2.1}$$

The coefficients c_j are defined by :

$$c_{2j} = 0, \quad c_{2j+1} = a_j + ib_j \quad 1 \leq j \leq N-1, \tag{2.2}$$

where a_j and b_j are arbitrary real numbers.

Then we have the following result:

Theorem 2.1. The function v defined by

$$v(x,y,t) = -2\,\partial_x^2\,(\ln\det(m_{2i-1,2j-1})_{1\le i,j\le N}) \tag{2.3}$$

is a solution to the KPI equation (1.1), depending on $2N-2$ parameters a_k, b_k, $1 \le k \le N-1$.

Proof The ideas and arguments are the same as those set out in the article [20]. We give a sketch of the proof.

If we consider

$$m_{ij} = \sum_{k=0}^{i} c_{i-k}\left(\frac{\sqrt{p^2-4}}{3}\partial_p\right)^k \sum_{l=0}^{j} c_{j-l}\left(\frac{\sqrt{q^2-4}}{3}\partial_q\right)^l$$
$$\times\left(\frac{1}{p+q}\exp\left(\frac{1}{2}(p+q)(-ix_1+\frac{3}{32}ix_3)-\frac{1}{4}(p^2-q^2)x_2)\right)\right)_{p=q=-1},$$
$$\phi_i = \sum_{k=0}^{i} c_{i-k}\left(\frac{\sqrt{p^2-4}}{3}\partial_p\right)^k \times\left(\exp\left(\frac{1}{2}p(-ix_1+\frac{3}{32}ix_3)-\frac{1}{4}p^2x_2)\right)\right)_{p=q=-1},$$

and

$$\psi_j = \sum_{l=0}^{j} c_{j-l}\left(\frac{\sqrt{q^2-4}}{3}\partial_q\right)^l \times\left(\exp\left(\frac{1}{2}q(-ix_1+\frac{3}{32}ix_3)+\frac{1}{4}q^2)x_2)\right)\right)_{p=q=-1},$$

then we have the relations

$$\partial_{x_1}m_{ij} = \phi_i\psi_j,\quad \partial_{x_n}\phi_i = \partial_{x_1}^n\phi_i,\quad \partial_{x_n}\psi_j = (-1)^{n-1}\partial_{x_1}^n\phi_i,\quad n=2,\ n=3.$$

From [21], this proves that $\tau = \det(m_{ij})$ satisfy the bilinear equation

$$(D_{x_1}^4 - 4D_{x_1}D_{x_3} + 3D_{x_2}^2)\tau\cdot\tau$$

So the function $\tilde{v}$ defined by $\tilde{v} = 2\partial_X^2\ln(\tau)$ verify the equation

$$(u_T + 6uu_X + u_{3x})_X = u_{2Y}$$

with $x_1 = X$, $x_2 = iY$, $x_3 = -4T$.
The next transformation given by $X = -ix$, $T = it$ and $Y = y$ proves that the new function v defined by $v(x,y,t) = \tilde{v}(X=-ix, Y=y, T=it)$ is a solution to the KPI equation (1.1).
In particular, the function v defined by

$$v(x,y,t) = -2\,\partial_x^2\,(\ln\det(m_{2i-1,2j-1})_{1\le i,j\le N})$$

is a solution to the KPI equation (1.1), depending on $2N-2$ parameters a_k, b_k, $1 \le k \le N-1$.
So we get the result. □

3 RATIONAL SOLUTIONS OF ORDER 3 DEPENDING ON 4 PARAMETERS

In the following, we explicitly construct rational solutions to the KPI equation of order 3 depending on 4 parameters.

Because of the length of the expression of the solution, we only give the expression without parameters and we present it in the appendix.

We give patterns of the modulus of the solutions in the plane (x, y) of coordinates in functions of parameters a_1, b_1, a_2, b_2 and time t.

In all the following figures, if the parameters are not quoted then there are equal to 0.

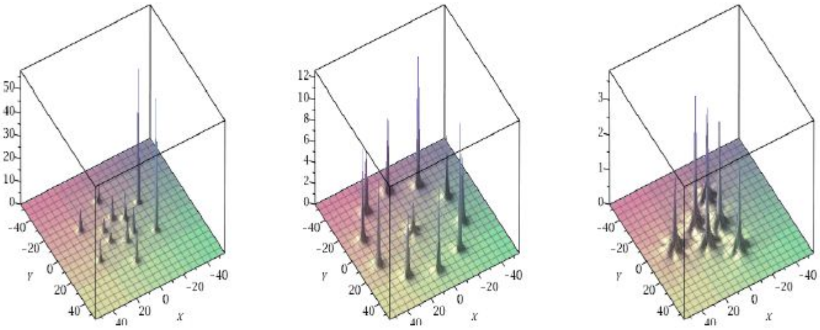

Fig. 1. Solution of order 3 to KPI, on the left for $t = 0$, $a_1 = 10^4$; in the center for $t = 0$, $a_2 = 10^8$; on the right for $t = 0$, $b_1 = 10^4$

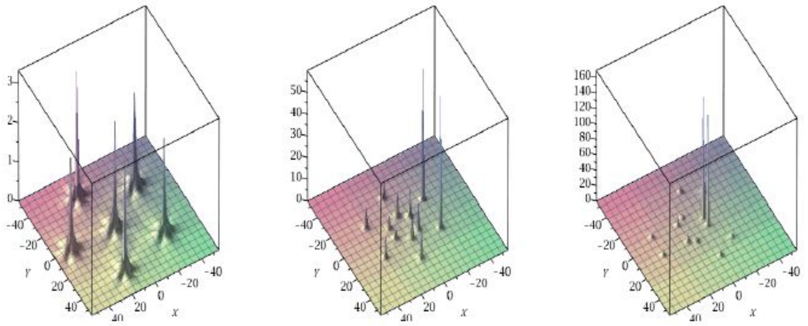

Fig. 2. Solution of order 3 to KPI, on the left for $t = 0$, $b_2 = 10^8$; in the center for $t = 0$, $a_1 = 10^4, \quad a_2 = 10^4$; on the right for $t = 0$, $a_1 = 10^4, \quad a_2 = 10^4, \quad b_1 = 10^4, \quad b_2 = 10^8$

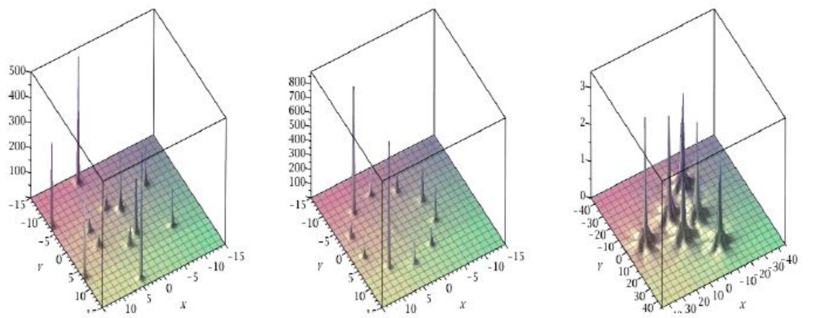

Fig. 3. Solution of order 3 to KPI, on the left for $a_1 = 10^3$; in the center for $a_2 = 10^5$; on the right for $b_1 = 10^4$; here $t = 1$

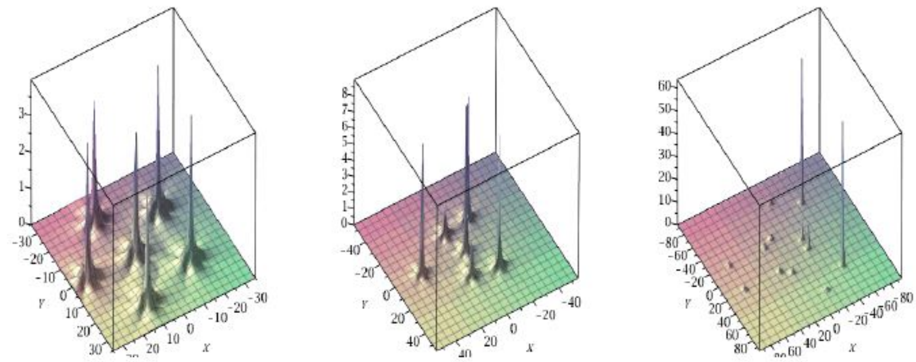

Fig. 4. Solution of order 3 to KPI, on the left for $t = 1$, $b_2 = 10^7$; in the center for $t = 1$, $a_1 = 10^3$, $a_2 = 10^5$, $b_1 = 10^4$, $b_2 = 10^7$; on the right for $t = 1$, $a_1 = 10^5$, $a_2 = 10^5$, $b_1 = 10^5$, $b_2 = 10^5$

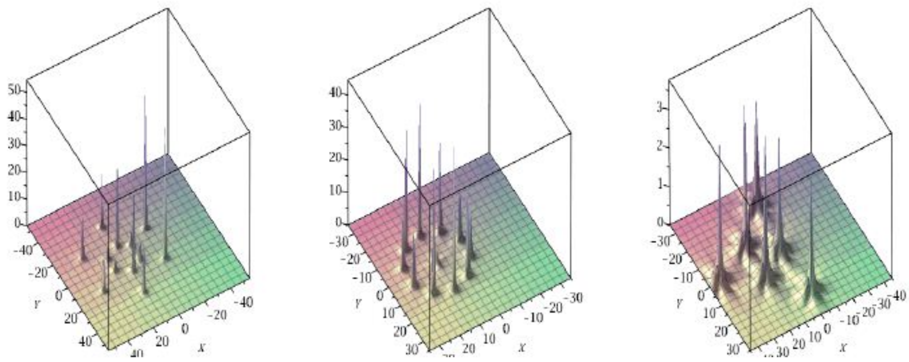

Fig. 5. Solution of order 3 to KPI, on the left for $t = 10$, $a_1 = 10^4$; in the center for $t = 10$, $a_2 = 10^4$; on the right for $t = 10$, $b_1 = 10^4$

X

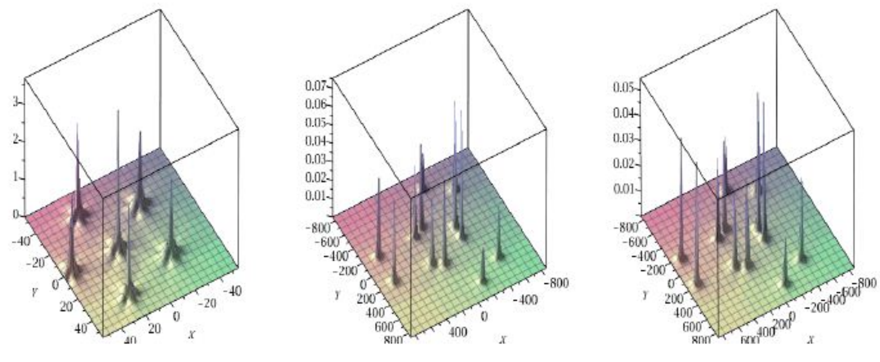

Fig. 6. Solution of order 3 to KPI, on the left for $t = 10$, $b_1 = 10^8$; in the center for $t = 10$, $a_1 = 10^8$, $a_2 = 10^8$, $b_1 = 10^8$, $b_2 = 10^8$; on the right for $t = 10^2$, $a_1 = 10^8$, $a_2 = 10^8$, $b_1 = 10^8$, $b_2 = 10^8$

The previous study shows the appearance of different types of configurations.

If $a_1 \neq 0$ and the other parameters equal to 0, we get 12 peaks on two concentric rings, 6 on the first and 6 on the second one.

For $a_2 \neq 0$ and the other parameters equal to 0, we get 10 peaks on a ring and a peak in the center of the ring.

If $b_1 \neq 0$ and the other parameters equal to 0, we get 6 peaks on a triangle.

For $b_2 \neq 0$ and the other parameters equal to 0, we get 5 peaks on a ring and one peak in the center of the ring.

In the case where two parameters a_1 and a_2 are not equal to 0, the other parameters being equal to 0, for the same values of parameters, we get 12 peaks on two concentric rings, which shows the predominance of the parameter a_1 over the parameter a_2 on the structure of the solutions.

In the case where two parameters b_1 and b_2 are not equal to 0, the other parameters being equal to 0, for the same values of parameters, we get 6 peaks on a ring with a peak in the center of the ring, which shows also the predominance of the parameter b_1 over the parameter b_2 on the structure of the solutions.

In the case where all parameters a_1, a_2, b_1, b_2, are not equal to 0, for the same values of parameters, we get 6 couples of 2 peaks on two rings.

4 CONCLUSION

In this article, rational solutions to the KPI equation have been built in terms of quotients of a polynomial of degree $2N(N+1)-2$ in x, y and t by a polynomial of degree $2N(N+1)$ in x, y and t, depending on $2N-2$ parameters.

Other approaches to build solutions of KPI equation had been realized, and we can mention those most significant. In 1990, Hirota and Ohta [22] built, the solutions as particular case of a hierarchy of coupled bilinear equations given in terms of Pfaffians. In 1993, the Darboux transformations was used to obtain among others the solutions of the multicomponent KP hierarchy [23], but no explicit solutions were given. More recently, in 2013, wronskians identities of bilinear KP hierarchy were given [24]. In 2014, solutions of KPI equation were constructed [25]; an explicit solution at order 1 was built and only one asymptotic study has been carried out for order higher than 2.

In 2016, three types of representations of the solutions were given in [26], in terms of Fredholm determinants, wronskians and degenerate determinants.

The structures of the solutions given in this paper looks like to these given in [26] which were deduced from the solutions to the NLS equation [27, 28, 29].

But, to the best of my knowledge, some of the structures of these solutions had never been presented. It will be relevant to find explicit solutions for higher orders and try to describe the structure of these rational solutions.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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APPENDIX

The general solution depending on 4 parameter being too large, we present only the solution without parameters. In can be written as:

$$v(x,y,t) = -2\frac{n_3(x,y,t)}{(d_3(x,y,t))^2}$$

with

$$\begin{aligned}
&n_3(x,y,t) = -3377699720527872\, x^{22}+(55732045388709888\, t+272467777455915008)x^{21}+(-4291367494930661376\, t-\\
&438889857436090368\, t^2-30399297484750848\, y^2-10655516718358593536)x^{20}+(2194449287180451840\, t^3+\\
&455989462271262720\, ty^2+32185256211979960320\, t^2+268346983796871004160+2229281815548395520\, y^2+\\
&159832750775378903040\, t)x^{19}+(-118219490218475520\, y^4-79015655462215352320\, y^2-152879967006904811520\, t^3-\\
&3823944519105411809280\, t-31767265871564636160\, ty^2-1138808349274574684160\, t^2-4877083144468331233280-\\
&7817725585580359680\, t^4-3248924918682746880\, t^2y^2)x^{18}+(25811625503961529712640\, t^2+1796373301367406592000\, y^2+\\
&214429044633061294080\, t^2y^2+14620162134072360960\, t^3y^2+5124637571735586078720\, t^3+1595963117949419520\, ty^4+\\
&67958991866047800279040+21107859081066971136\, t^5+515969888648303738880\, t^4+7802486354419384320\, y^4+\\
&65840622450322471649280\, t+1066711348739907256320\, ty^2)x^{17}+(-109699408391836501278720\, t^3-\\
&419733968120805756764160\, t^2-866477146292109453557760\, t-44854200547267313664\, t^6-253327479039590400\, y^6-\\
&16334782259907180625920\, t^4-99481701018847150080\, ty^4-753040926423114370252800-29326224801537279918080\, y^2-\\
&22903759592434434048000\, ty^2-10174264876927549440\, t^2y^4-911323439690510499840\, t^3y^2-46601766802355650560\, t^4y^2-\\
&1315723216053174534144\, t^5-6800284848216908759040\, t^2y^2-247945677484882657280\, y^4)x^{16}+(6793167708394783548375040+\\
&27201139392867635036160\, t^3y^2+76892915223886823424\, t^7+596890206113082900480\, t^2y^4+2975348129818591887360\, ty^4+\\
&40697059507710197760\, t^3y^4+351914697618447359016960\, ty^2+5027548408018779504640\, y^4+111844240325653561344\, t^5y^2+\\
&5198862877752656721346560\, t^2 + 329098225175509503836160\, t^4 + 364818141054811661926400\, y^2 +\\
&39203477423777233502208\, t^5+3039929748475084800\, ty^6+1678935872483223027056640\, t^3+14861878770322636800\, y^6+\\
&2631446432106349068288\, t^6+2733970319071531499520\, t^4y^2+9036491117077372443033600\, t+137422557554606604288000\, t^2y^2)x^{15}+\\
&(-50830262533560219992064000\, t^2-114460479865434931200\, t^4y^4-2238338272924060876800\, t^3y^4-\\
&167196136166129664000\, ty^6-6151433217910945873920\, t^5y^2-17099604835172352000\, t^2y^6-209707950610600427520\, t^6y^2-\\
&3581857799555756798771200\, y^2-4104204086866631196672000\, ty^2-1979520174103766394470400\, t^2y^2-\\
&76503204542440223539200\, t^4y^2-16736333230229579366400\, t^2y^4-515334590829774766080000\, t^3y^2-\\
&56559919590211269427200\, ty^4 - 76423136719441314919219200\, t - 72727729662480665804800\, y^4 -\\
&4722007141359064763596800\, t^4 - 19495735791572462705049600\, t^3 - 417663829442339799040\, y^6 -\\
&73506520169582312816640\, t^6-740471006644896383631360\, t^5-108130662033590845440\, t^8-4229110337313775288320\, t^7-\\
&303992974847508480\, y^8 - 50665380065407656578252800)x^{14} + (401221467777066903325900800\, t^2 +\\
&5875637966425659801600\, t^4y^4+240367007717413355520\, t^5y^4+314561925915900641280\, t^7y^2+59848616923103232000\, t^3y^6+\\
&3191926235898839040\, ty^8+58577166305803527782400\, t^3y^4+4385470209144567889920\, ty^6+160656729539124469432320\, t^5y^2+\\
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&315552065422425037419315200)x^{13}+(-2593434142098054421099315200\, t^2-142781842870396098969600\, t^4y^4-\\
&145881003750064128000\, t^4y^6-15560640400006840320\, t^2y^8-390596387540796702720\, t^6y^4-383372347210003906560\, t^8y^2-\\
&11457494034530036613120\, t^5y^4 - 14994118468657930567680\, t^7y^2 - 2852784073334587392000\, t^3y^6 -\\
&152148483911177994240\, ty^8 - 965053628007979784601600\, t^3y^4 - 72496447303617053982720\, ty^6 -\\
&2637868936809909583872000\, t^5y^2-21379167269579768463360\, t^2y^6-261067185501077262827520\, t^6y^2-\\
&6013266260868024238080\, t^9-183472215475600823523737600\, y^2-276533948756518486042214400\, ty^2-
\end{aligned}$$

$$
\begin{aligned}
&183346346114760301137100800\, t^3 y^2 - 16887781485322757052825600\, t^4 y^2 - 3722750662098229080883200\, t^2 y^4 - \\
&70027982232161894793216000\, t^3 y^2 - 7756097195342640552345600\, t y^4 - 3076832637868644114838323200\, t - \\
&6806724714209071857664000\, y^4 - 433645677239435626807296000\, t^4 - 1303969770275467435809177600\, t^3 - \\
&93526433606588185251840\, y^6 - 16113849369887808506774080\, t^6 - 99793797583111543471472640\, t^5 - \\
&122998628063209586688\, t^{10} - 134379107185017665617920\, t^8 - 1804898078696934935101440\, t^7 - 380824384490449141760\, y^8 - \\
&1651029307663187554403942400 - 141863388262170624\, y^{10})x^{12} + (13844846870408898516772454400\, t^2 + \\
&2171370663017954515353600\, t^4 y^4 + 6418764165002821632000\, t^4 y^6 + 684668177600300974080\, t^2 y^8 + \\
&17186241061796054919680\, t^6 y^4 + 16868383277240171888640\, t^8 y^2 + 257007317166712978145280\, t^2 y^4 + \\
&335657809929966480778240\, t^7 y^2 + 64137501808739305390080\, t^3 y^6 + 3427419460414042275840\, t y^8 + \\
&11168251966294687242649600\, t^3 y^4 + 841737902450293667266560\, t y^6 + 30398006673580962695086080\, t^5 y^2 + \\
&326234012866276742922240\, t^2 y^6 + 3956803405214864375808000\, t^6 y^2 + 100635241142626025472\, t^{11} + \\
&134379107185017665617920\, t^9 + 975740017070668988914073600\, y^2 + 1651249939280407411713838400\, t y^2 + \\
&1244402769404333187189964800\, t^2 y^2 + 157562960022364263284736000\, t^4 y^2 + 34902437379041882485555200\, t^2 y^4 + \\
&550039038344280903411302400\, t^3 y^2 + 61260522427881646718976000\, t y^4 + 14859263768878867989635481600\, t + \\
&4650996785668092998451200\, y^4 + 2933931983119801730570649600\, t^4 + 7780302426294163263297945600\, t^3 + \\
&878612385407285267005440\, y^6 + 149690696374667315207208960\, t^6 + 780562219030984128253132800\, t^5 + \\
&5411939634781221814272\, t^{10} + 2030510338534051801989120\, t^8 + 20717806332712896650280960\, t^7 + \\
&5819866690462070865920\, y^8 + 7277822304196982485286912000 + 6241989083535507456\, y^{10} + 383372347210003906560\, t^9 y^2 + \\
&502195355409695760640\, t^7 y^4 + 2625855806750115430400\, t^5 y^6 + 46681921200020620960\, t^3 y^8 + 1276770494359535616\, t y^{10})x^{11} + \\
&(-61294463046624587967246361600\, t^2 - 23034519721732792437964800\, t^4 y^4 - 132283597480624817367040\, t^4 y^6 - \\
&14138105274207924387840\, t^2 y^8 - 353385061104230344949760\, t^6 y^4 - 346147116490267620802560\, t^8 y^2 - \\
&3582761593979624950333440\, t^5 y^4 - 4866337544186037587148800\, t^7 y^2 - 897143535382261043036160\, t^3 y^6 - \\
&48013900196312084643840\, t y^8 - 95981702792365176835276800\, t^3 y^4 - 7248552179610103452794880\, t y^6 - \\
&259978884036901034419814400\, t^5 y^2 - 3472168847607461377474560\, t^2 y^6 - 41797259176173823706743360\, t^6 y^2 - \\
&69186728285555392512\, t^{12} + 141863388262170624\, y^{12} - 4068964726085916360704\, t^{11} - 1861301143656214151823360\, t^9 - \\
&4269070189601098699522048000\, y^2 - 8049865140833019158541107200\, t y^2 - 6811405999531680673318758400\, t^2 y^2 - \\
&1134455616585079383285811200\, t^4 y^2 - 252699655015011792715776000\, t^2 y^4 - 3422107615861916264772403200\, t^3 y^2 - \\
&383707225981761767237222400\, t y^4 - 60042034009625105503617024000\, t - 256814550028148852706508800\, y^4 - \\
&160468737542317111730552012800\, t^4 - 38073328893624470921124249600\, t^3 - 6360200106986683519467520\, y^6 - \\
&1073273051167603176348057600\, t^6 - 4840987772147672855441571840\, t^5 - 110862763427639574134784\, t^{10} - \\
&21365237780610174670602240\, t^8 - 176421177870143621494210560\, t^7 - 61757051042198684958720\, y^8 - \\
&27031856607283943793151180800 - 128181452594219067152\, y^{10} - 316282186448253222912\, t^{10} y^2 - \\
&517888960266145628160\, t^8 y^4 - 381055484281408716800\, t^6 y^6 - 96281462475042324480\, t^4 y^8 - 5266678289233084416\, t^2 y^{10} - \\
&15462684670803490897920\, t^9 y^2 - 20255212668187029012480\, t^7 y^4 - 10590960872254655692800\, t^5 y^6 - \\
&1882837488400827678720\, t^3 y^8 - 51496409939167936512\, t y^{10})x^{10} + (225157627536094145638563840000\, t^2 + \\
&179965692735684706566144000\, t^4 y^4 + 1682144128841739455692800\, t^4 y^6 + 180062125736170317414400\, t^2 y^8 + \\
&4478451992474531187916800\, t^6 y^4 + 4371914476744102379520000\, t^8 y^2 + 34551779682599188656947200\, t^2 y^4 + \\
&44782777688757668256153600\, t^7 y^2 + 8680422119018653443686400\, t^3 y^6 + 463177882816490137190400\, t y^8 + \\
&631749137537529481789440000\, t^3 y^4 + 47701500802400126396006400\, t y^6 + 1701683274877619044928716800\, t^5 y^2 + \\
&27182070673537887947980800\, t^2 y^6 + 324973605046126293024768000\, t^6 y^2 + 39915420164743495680\, t^{13} + \\
&2536846703803697725440\, t^{12} - 5201657569612922880\, y^{12} + 75588247791572436910080\, t^{11} + 17804364817175145558835200\, t^9 + \\
&15289389136008170537222144000\, y^2 + 32018026421258240246415360000\, t y^2 + 30186956778123821844629152000\, t^2 y^2 + \\
&6416451779741092996448256000\, t^4 y^2 + 1438902097431606627139584000\, t^2 y^4 + 17028514998829201433296896000\, t^3 y^2 + \\
&1926109126211116395298816000\, t y^4 + 202738923804629578448633856000\, t + 1161999156144162429992960000\, y^4 + \\
&71387491675545882977107968000\, t^4 + 153236157616561469893115904000\, t^3 + 361133566065667476432896000\, y^6 + \\
&6051234715184591069301964800\, t^6 + 24070310631347567595828019200\, t^5 + 1395975857742160613887520\, t^{10} + \\
&165394854253265645150822400\, t^8 + 1149935411965289117515776000\, t^7 + 477089389475446915072000\, y^8 + \\
&84392491833236816180281344000 + 1596120743936377487360\, y^{10} + 215646945305627197440\, t^{11} y^2 + \\
&431574133556121356800\, t^9 y^4 + 388845161730080768000\, t^7 y^6 + 144422193712563486720\, t^5 y^8 + 13166695723082711040\, t^3 y^{10} - \\
&1063975411966279680\, t y^{12} + 11597013503102618173440\, t^{10} y^2 + 18989261876425339699200\, t^8 y^4 + 13238701090318319616000\, t^6 y^6 + \\
&3530320290761551897600\, t^4 y^8 + 193111537271879761920\, t^2 y^{10} + 288455930408556350668800\, t^9 y^2 + \\
&378626851183103941017600\, t^7 y^4 + 198425396220787226050560\, t^5 y^6 + 35345263185519810969600\, t^3 y^8 + \\
&961380894456642928640\, t y^{10})x^9 + (-684243867840624827264139264000\, t^2 - 1066076669594581000519680000\, t^4 y^4 - \\
&14648212326843977686220800\, t^4 y^6 - 1563225354505654213017600\, t^2 y^8 - 38870752030424087239065600\, t^6 y^4 - \\
&37785468674889282591129600\, t^8 y^2 - 242963685193174353864294400\, t^5 y^4 - 313367404865907496845312000\, t^7 y^2 - \\
&61159659015460247882956800\, t^3 y^6 - 3220353378959266676736000\, t y^8 - 322375297192221114911064064000\, t^3 y^4 - \\
&243765157087580465922048000\, t y^6 - 8662209902650475545205145600\, t^5 y^2 - 160992565208100426586521600\, t^2 y^6 - \\
&1914393684237321425544806400\, t^6 y^2 - 19244934722287042560\, t^{14} + 303992974847508480\, y^{14} - 1317208865436535357440\, t^{13} - \\
&42518389382759495761920\, t^{12} + 91107820461705134080\, y^{12} - 8566821549069053103964160\, t^{11} - 124046140689944733863116800\, t^9 - \\
&442910787678933911621926912000\, y^2 - 103203376668055151126249472000\, t y^2 - 108060839171746560831651840000\, t^2 y^2 - \\
&28735619060624277418688512000\, t^4 y^2 - 6500618297587517834133504000\, t^2 y^4 - 67920652750778599150190592000\, t^3 y^2 - \\
&7775994303973096402452480000\, t y^4 - 569649319874348509216899072000\, t - 4195747633125559216635904000\, y^4 - \\
&258586015977947480444633088000\, t^4 - 506604661966211827686768640000\, t^3 - 162289187851092388059545600\, y^6 - \\
&27079099460266013545306521600\, t^6 - 96373113761986942019095756800\, t^5 - 12017946251593223252213760\, t^{10} - \\
&970258003845712692903936000\, t^8 - 5835119189642284245398323200\, t^7 - 2735706414506636319129600\, y^8 - \\
&220256237263735013934891008000 - 12971177574759965169280\, y^{10} - 7116349195085697515520\, t^{11} y^2 - \\
&14241946407319004774400\, t^9 y^4 - 127655890337092665344000\, t^7 y^6 - 4765932392614596061760\, t^5 y^8 - \\
&434500958861729464320\, t^3 y^{10} + 35111188594887229440\, t y^{12} - 194707753025775536701440\, t^{10} y^2 -
\end{aligned}
$$

$$
\begin{aligned}
&319466405685743950233600\,r^8y^4-2232228570748385629306880\,r^6y^6-59645131625564681011200\,r^4y^8-\\
&3244593018791169884160\,r^2y^{10}-3278935857558076784640000\,r^9y^2-4318507278457583645491200\,r^7y^4-\\
&2270894573936348265185280\,r^5y^6-405117282906383214182400\,r^3y^8-10773815021570548039680\,ry^{10}-\\
&121301406734415298560\,r^{13}y^2-291312540149706915840\,r^{10}y^4-326400605209755648000\,r^8y^6-162474967926633922560\,r^6y^8-\\
&22218799032702074880\,r^4y^{10}+3590917015386193920\,r^2y^{12})x^8+(1708947959623045527650697216000\,r^2+\\
&4856294578831672366596096000\,r^4y^4+91739488523190371824435200\,r^4y^6+9661060136877800030208000\,r^2y^8+\\
&242953685193174353864294400\,r^6y^4+235025553649430622633984000\,r^8y^2+1279292003513497200623616000\,r^2y^4+\\
&1640908872203418364752691200\,r^7y^2+321985130416200853173043200\,r^3y^6+16414238487039817914777600\,ry^8+\\
&130012366596176035668267008000\,r^5y^4+973735127106554328357273600\,ry^6+34482742872629132902426214400\,r^5y^2+\\
&731295471262741397766144000\,r^3y^6+8662209902650475545205145600\,r^6y^2+7697973888914817024\,r^{15}+\\
&564518085187086581760\,r^{14}-8917127262193582080\,y^{14}+19623872022812074967040\,r^{13}+428310774534526551982080\,r^{12}-\\
&1011958836270150451200\,y^{12}+655524340995939955752960\,r^{11}+646838669230475128602624000\,r^9+\\
&101483558290497936736387072000\,y^2+265746472547363469731561472000\,ry^2+309610130004165453378748416000\,r^2y^2+\\
&101880979126167898725285888000\,r^4y^2+23327982911919289207357440000\,r^2y^4+216121678343493121663303680000\,r^3y^2+\\
&25174485798753355299815424000\,ry^4+1321537423582410083609346048000\,r+12326152141476598822993920000\,y^4+\\
&759906992934317741530152960000\,r^4+1368487735681249654526278528000\,r^3+578688656017485908148224000\,y^6+\\
&96373113761986942019095756800\,r^6+310303219173536976533559705600\,r^5+74427684413966840317870080\,r^{10}+\\
&4376339392231713184048742400\,r^8+23210656680228011610262732800\,r^7+11625166938289374599577600\,y^8+\\
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&17577854791012773223464960\,r^5y^6+3126450709011308426035200\,r^3y^8+77827065448559731015680\,ry^{10}+\\
&55985264646653214720\,r^{13}y^2+158897749172567408640\,r^{11}y^4+217600403473170432000\,r^9y^6+139264258222829076480\,r^7y^8+\\
&26662558839242489856\,r^5y^{10}-7181834030772387840\,r^3y^{12}-1823957849085060880\,ry^{14}+3558174597542848757760\,r^{12}y^2+\\
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\end{aligned}
$$

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$$176738127717888\,t^{21}+18145114445703168\,t^{20}-222928181554839552\,y^{20}+901090715540620960\,t^{19}+$$
$$28744387585915944960\,t^{18}-33349155240678522880\,y^{18}+659893943249566433280\,t^{17}+7603900528352051938826649600\,t^8+$$
$$235205268992084216540823552000\,t^7-768412131911995125399552000\,y^8+117773106967986435753246720000-$$
$$85529414940804476462694400\,y^{10}+92987687744683053259161600\,t^{11}y^2+192828399208223490441216000\,t^9y^4+$$
$$173303932534345240569446400\,t^7y^6+50648382087992434910822400\,t^5y^8-7879807980881764260249600\,t^3y^{10}-$$

$$
\begin{gathered}
3011263210946964750336000\, t y^{12} + 604420847843232406988390400\, t^{10} y^{2} + 1037969942797190053232640000\, t^{8} y^{4} + \\
720959036049128561836032000\, t^{6} y^{6} + 1131114398260326628851712000\, t^{4} y^{8} - 365485752974723203989604000\, t^{2} y^{10} + \\
3205417968829884555919360000\, t^{9} y^{2} + 4480617614084764865174937600\, t^{7} y^{4} + 2325188969569593772631654400\, t^{5} y^{6} + \\
1042282934020613978122240000\, t^{3} y^{8} - 850332660362310208978944000\, t y^{10} + 975046600756863959040000\, t^{14} y^{2} + \\
327579820123520552140800\, t^{12} y^{4} + 5442552663851381922201600\, t^{10} y^{6} + 4298652856313425428480000\, t^{8} y^{8} + \\
838991960928936121139200\, t^{6} y^{10} - 767469451596949094400000\, t^{4} y^{12} - 35148427734306049228800\, t^{2} y^{14} + \\
1191331979868648348057600\, t^{13} y^{2} + 3449795330852492673024000\, t^{11} y^{4} + 4775536297066455524966400\, t^{9} y^{6} + \\
2921381801038092592742400\, t^{7} y^{8} + 2530403798410013442048000\, t^{5} y^{10} - 383381740668007350272000\, t^{3} y^{12} - \\
79982578302211797811200\, t y^{14} + 11679448943226571141939200\, t^{12} y^{2} + 28810636685939853151436800\, t^{10} y^{4} + \\
32538720614656889585664000\, t^{8} y^{6} + 14483209688986982075596800\, t^{6} y^{8} - 4112352365229939621888000\, t^{4} y^{10} - \\
13551459631347202523136000\, t^{2} y^{12} + 1069121663848484152320\, t^{17} y^{2} + 530145982993032806400\, t^{15} y^{4} + \\
138915698135971921920\, t^{13} y^{6} + 193010036199559004160\, t^{11} y^{8} + 96244641548615024640\, t^{9} y^{10} - 97291407885619691520\, t^{7} y^{12} - \\
173261745992383856640\, t^{5} y^{14} - 93553838009320734720\, t^{3} y^{16} - 16314289650149621760\, t y^{18} + 306073498299531264000\, t^{16} y^{2} + \\
1343708942544823910400\, t^{14} y^{4} + 30618973137125661192960\, t^{12} y^{6} + 3805108633285563514880\, t^{10} y^{8} + \\
1438130703868090122240\, t^{8} y^{10} - 1260748520870746521600\, t^{6} y^{12} - 1592115706861506740800\, t^{4} y^{14} - \\
532405696323555164160\, t^{2} y^{16} + 6270397787367580631040\, t^{15} y^{2} + 24189366250357810790400\, t^{13} y^{4} + \\
47401219751155272253440\, t^{11} y^{6} + 46370088030380123750400\, t^{9} y^{8} + 13851545583984385720320\, t^{7} y^{10} - \\
11439122646585248317440\, t^{5} y^{12} - 9335624257566985420800\, t^{3} y^{14} - 1623390039680105840640\, t y^{16} + \\
2570736403169280\, t^{19} y^{2} + 15995693175275520\, t^{17} y^{4} + 54165310223155200\, t^{15} y^{6} + 101108579083223040\, t^{13} y^{8} + \\
71899434014736384\, t^{11} y^{10} - 106517680021831680\, t^{9} y^{12} - 324625310642725120\, t^{7} y^{14} - 360694789491916800\, t^{5} y^{16} - \\
199495389743677440\, t^{3} y^{18} - 45598946227126272\, t y^{20} + 238792848116613120\, t^{18} y^{2} + 1329419832789665440\, t^{16} y^{4} + \\
3972122749698048000\, t^{14} y^{6} + 6426011915067064320\, t^{12} y^{8} + 3866591784792489984\, t^{10} y^{10} - 4686777920960593920\, t^{8} y^{12} - \\
11109399616351037440\, t^{6} y^{14} - 8816983743135744000\, t^{4} y^{16} - 2925932382907269120\, t^{2} y^{18}) x - 3405391301709054049517568000\, t^{3} y^{6} + \\
576309098933996344049664000\, t y^{8} - 3100393880240560105586688000\, t y^{6} - 50020774645148296245411840000\, t^{5} y^{2} - \\
278211702918588327977287680000\, t^{7} - 27817753500087141741363200000\, t^{5} y^{4} - 1968554946105670927122432000\, t^{4} y^{6} + \\
283468940449493450489856000\, t^{2} y^{8} - 5126123678130560386990080000\, t^{6} y^{4} - 4434109004677459017203712000\, t^{8} y^{2} - \\
12394138836776158532468736000\, t^{3} y^{4} - 13546419798664488991850496000\, t^{7} y^{2} - 403592378069118683499724800000\, t^{4} - \\
418845308611361149267476480000\, t^{9} - 8008008843990377284239360000\, y^{8} - 149492548546980470939713536000\, t^{6} - \\
280318661681845016897519616000\, t^{3} - 1522258849047288510362419200\, t^{10} - 6025163444928\, t^{22} - \\
222960708644818561007616000000\, t^{4} y^{4} + 3377699720527872\, y^{22} - 648039801632256\, t^{21} - 33790901832769536\, t^{20} + \\
580964351930793984\, y^{20} - 1134646878391418880\, t^{19} - 27495580968731934720\, t^{18} + 46071824188000174080\, y^{18} - \\
510844127676512993280\, t^{17} - 22050493968007895300702208000\, t^{8} - 63555369042495675404648448000\, t^{7} + \\
493536726717588129710080000\, y^{8} - 41830471019036880881819648000\, t^{2} y^{6} - 31372686473663319040327680000\, t^{6} y^{2} - \\
7547424794481446092800\, t^{16} + 1840193325741721518080\, y^{16} - 90780231806598481182720\, t^{15} - 902753108091886318387200\, t^{14} + \\
66281277155862537830400\, y^{14} - 7496653729684307469926400\, t^{13} - 52298585551292756026982400\, t^{12} + \\
2341367234189406398054400\, y^{12} - 307379815035243715362816000\, t^{11} - 6336583773626709949022208000\, t^{9} + \\
97174929823379754602987520000\, y^{2} + 198340849960616489983672320000\, t y^{2} + 161170639010888159078645760000\, t^{2} y^{2} - \\
38057250485359866261012480000\, t^{4} y^{2} - 19755464273354181763399680000\, t^{2} y^{4} + 41781236183833579848990720000\, t^{3} y^{2} - \\
3442478512406550727168000000\, t y^{4} - 88329830225989826814935040000\, t + 38968112185933940601651200000\, y^{4} + \\
5909335606983379602800064000\, y^{10} - 41210512352947664112844800\, t^{11} y^{2} - 86497495233099171102720000\, t^{9} y^{4} - \\
77245611006263774482432000\, t^{7} y^{6} - 16967159739048994327756800\, t^{5} y^{8} + 9137143824368080099737600\, t^{3} y^{10} + \\
2363295091890087316684800\, t y^{12} - 24040634691224134169395200\, t^{10} y^{2} - 42004852632044668810150400\, t^{8} y^{4} - \\
29064862119619922157895680\, t^{6} y^{6} - 19642805012884637089792000\, t^{4} y^{8} + 31887474763586632836710400\, t^{2} y^{10} - \\
114799898667926338456780800\, t^{9} y^{2} - 1645342696130940040642560000\, t^{7} y^{4} - 859156192363493406491200000\, t^{5} y^{6} + \\
50480185648692898824192000\, t^{3} y^{8} + 64147061205603357347020800\, t y^{10} - 638213560643918757888000\, t^{14} y^{2} - \\
2156122081782807920640000\, t^{12} y^{4} - 358165222279984164372480\, t^{10} y^{6} - 273879643847321180569600\, t^{8} y^{8} - \\
31630047480126168025600\, t^{6} y^{10} + 71880326375251378176000\, t^{4} y^{12} + 29993466863329424179200\, t^{2} y^{14} - \\
673814362109225258188800\, t^{13} y^{2} - 1964354774041353623961600\, t^{11} y^{4} - 2711560051221407465472000\, t^{9} y^{6} - \\
1551772466677176650956800\, t^{7} y^{8} + 616852854784490943283200\, t^{5} y^{10} + 338786490783680063078400\, t^{3} y^{12} + \\
64160081731371034214400\, t y^{14} - 5811730484042690828697600\, t^{12} y^{2} - 14462129940616761783091200\, t^{10} y^{4} - \\
16247243675094866303385600\, t^{8} y^{6} - 6331047760999054363852800\, t^{6} y^{8} + 1477463996415330798796800\, t^{4} y^{10} + \\
1129223704106111781376000\, t^{2} y^{12} - 13503242572038144000\, t^{17} y^{2} - 67185447127241195520\, t^{15} y^{4} - \\
176647921944955453440\, t^{13} y^{6} - 245802861360379330560\, t^{11} y^{8} - 119844225322340843520\, t^{9} y^{10} + 135080198664722841600\, t^{7} y^{12} + \\
238817356029225861120\, t^{5} y^{14} + 133101424080888791040\, t^{3} y^{16} + 25011866430508892160\, t y^{18} - 293924896282855342080\, t^{16} y^{2} - \\
1295858906269168435200\, t^{14} y^{4} - 2962576234447204515840\, t^{12} y^{6} - 3477756602278509281280\, t^{10} y^{8} - \\
1298582398408536161280\, t^{8} y^{10} + 1429890330823156039680\, t^{6} y^{12} + 1750429548293809766400\, t^{4} y^{14} + \\
608771264880039690240\, t^{2} y^{16} - 4875233003784319795200\, t^{15} y^{2} - 18898835776356964931200\, t^{13} y^{4} - \\
37108313617168513105920\, t^{11} y^{6} - 35822107135945211904000\, t^{9} y^{8} - 8989199474238601297920\, t^{7} y^{10} + \\
11512041773964236416000\, t^{5} y^{12} + 8787106933576512307200\, t^{3} y^{14} + 1566822013810565304320\, t y^{16} - \\
96402615118848\, t^{20} y^{2} - 666487215636480\, t^{18} y^{4} - 2538998916710400\, t^{16} y^{6} - 5416531022315520\, t^{14} y^{8} - \\
4493714625921024\, t^{12} y^{10} + 7988826001637376\, t^{10} y^{12} + 30433622863380480\, t^{8} y^{14} + 45086848686489600\, t^{6} y^{16} + \\
37405385576939520\, t^{4} y^{18} + 17099604835172352\, t^{2} y^{20} - 9426033478287360\, t^{19} y^{2} - 58650874976010240\, t^{17} y^{4} - \\
198606137484902400\, t^{15} y^{6} - 370731456638484480\, t^{13} y^{8} - 263831258054033408\, t^{11} y^{10} + 390564826746716160\, t^{9} y^{12} + \\
1190292805323325440\, t^{7} y^{14} + 1322647561470361600\, t^{5} y^{16} + 731483095726817280\, t^{3} y^{18} + 167196136166129664\, t y^{20} - \\
445467359936839680\, t^{18} y^{2} - 2485069295279841280\, t^{16} y^{4} - 7441912400141352960\, t^{14} y^{6} - 12063127262472437760\, t^{12} y^{8} - \\
7218348116146126848\, t^{10} y^{10} + 9121069489276846080\, t^{8} y^{12} + 21657718249047982080\, t^{6} y^{14} + 17541344626747637760\, t^{4} y^{16} + \\
6117858618806108160\, t^{2} y^{18}
\end{gathered}
$$

and

$$
\begin{aligned}
&d_3(x,y,t) = 16777216\,x^{12} + (-738197504 - 150994944\,t)x^{11} + (6090129408\,t + 15435038720 + 622854144\,t^2 + \\
&100663296\,y^2)x^{10} + (-754974720\,ty^2 - 1557135360\,t^3 - 200991047680 - 3690987520\,y^2 - 22837985280\,t^2 - \\
&115762790400\,t)x^9 + (251658240\,y^4 + 64760053760\,y^2 + 51385466880\,t^3 + 2827865920\,t^4 + 1799188643840 + \\
&1356889671840\,t + 390699417600\,t^2 + 25480396800\,t^2y^2 + 24914165760\,ty^2)x^8 + (-7381975040\,y^4 - \\
&10795131863040\,t - 4070068715520\,t^2 - 1509949440\,ty^4 - 708669603840\,y^2 - 11563863900160 - 781398835200\,t^3 - \\
&388560322560\,ty^2 - 5096079360\,t^3y^2 - 77078200320\,t^4 - 3153199104\,t^5 - 74742497280\,t^2y^2)x^7 + \\
&(38755368960\,ty^4 + 335544320\,y^6 + 1019970846720\,t^2y^2 + 103347650560\,y^4 + 28337221140480\,t^2 + \\
&6688604160\,t^4y^2 + 60710285475840\,t + 130799370240\,t^3y^2 + 3963617280\,t^2y^4 + 80932110336\,t^5 + \\
&2759049216\,t^6 + 1025585971200\,t^4 + 54293755330560 + 7122620252160\,t^3 + 6308311142400\,y^2 + 3720515420160\,ty^2)x^6 + \\
&(-8371159695360\,t^2y^2 - 1529956270080\,t^3y^2 - 6019743744\,t^5y^2 - 1509949440\,ty^6 - 1773674496\,t^7 - \\
&23887400140800\,ty^2 - 186336485048320 - 244321898987520\,t - 136598142320640\,t^2 - 42505831710720\,t^3 - \\
&28245114224640\,y^2 - 87199580160\,t^2y^4 - 890534625280\,y^4 - 5945425920\,t^3y^4 - 923027374080\,t^5 - \\
&147149291520\,t^4y^2 - 60699082752\,t^6 - 8012947783680\,t^4 - 465064427520\,ty^4 - 7381975040\,y^6)x^5 + \\
&(458103560601600\,t^2 + 5573836800\,t^4y^4 + 108999475200\,t^3y^4 + 27682406400\,ty^6 + 110361968640\,t^5y^2 + \\
&2831155200\,t^2y^6 + 37623398400\,t^6y^2 + 107786901913600\,y^2 + 105919178342400\,ty^2 + 44788875264000\,t^2y^2 + \\
&1434334003200\,t^4y^2 + 871995801600\,t^2y^4 + 10463949619200\,t^3y^2 + 3339504844800\,ty^4 + 698761818931200\,t + \\
&5106984550400\,y^4 + 39849217228800\,t^4 + 170747677900800\,t^3 + 75833016320\,y^6 + 576892108800\,t^6 + \\
&6009710837760\,t^5 + 831409920\,t^8 + 32617366760\,t^7 + 251658240\,y^8 + 460685574144000)x^4 + (-1048142728396800\,t^2 - \\
&817496064000\,t^4y^2 - 3344302080\,t^5y^4 - 1612431360\,t^7y^2 - 2831155200\,t^3y^6 - 754974720\,ty^8 - 871995801600\,t^3y^4 - \\
&227499048960\,ty^6 - 860600401920\,t^5y^2 - 41523609600\,t^2y^6 - 55180984320\,t^6y^2 - 277136640\,t^9 - \\
&292272524492800\,y^2 - 323360705740800\,ty^2 - 158878767513600\,t^2y^2 - 7847962214400\,t^4y^2 - 5009257267200\,t^2y^4 - \\
&44788875264000\,t^3y^2 - 15320953651200\,ty^4 - 1382056722432000\,t - 19704840192000\,y^4 - 128060758425600\,t^4 - \\
&458103560601600\,t^3 - 459024629760\,y^6 - 3004855418880\,t^6 - 23909530337280\,t^5 - 12194012160\,t^8 - \\
&247239475200\,t^7 - 3690987520\,y^8 - 792542262067200)x^3 + (1554813812736000\,t^2 + 490497638400\,t^4y^4 + \\
&15925248000\,t^4y^6 + 849346560\,t^2y^8 + 1254113280\,t^6y^4 + 453496320\,t^8y^2 + 36787322880\,t^5y^4 + 17738744960\,t^7y^2 + \\
&31142707200\,t^3y^6 + 8304721920\,ty^8 + 3756942960400\,t^3y^4 + 1032805416960\,ty^6 + 3531582996480\,t^5y^2 + \\
&255936430080\,t^2y^6 + 322726150720\,t^6y^2 + 30488503040\,t^9 + 544467635404800\,y^2 + 657613180108800\,ty^2 + \\
&383780793968400\,t^2y^2 + 25193742336000\,t^4y^2 + 17236072857600\,t^2y^4 + 119159075636200\,t^3y^2 + 44335890432000\,ty^4 + \\
&1783220089651200\,t + 49143821107200\,y^4 + 257683252838400\,t^4 + 786107046297600\,t^3 + 1727382159360\,y^6 + \\
&8966073876480\,t^6 + 57627341291520\,t^5 + 62355744\,t^{10} + 69538102400\,t^8 + 965846384640\,t^7 + 23488102400\,y^8 + \\
&100663296\,y^{10} + 891610044825600)x^2 + (-1337415067238400\,t^2 - 1406853606400\,t^4y^4 - 11878515200\,t^4y^6 - \\
&6228541440\,t^2y^8 - 9196830720\,t^6y^4 - 3325639680\,t^8y^2 - 147149291520\,t^5y^4 - 69155389440\,t^7y^2 - \\
&127968215040\,t^3y^6 - 35232153600\,ty^8 - 8618036428800\,t^3y^4 - 2591073239040\,ty^6 - 7558122700800\,t^5y^2 - \\
&774804062720\,t^2y^6 - 882895749120\,t^6y^2 - 8503056\,t^{11} - 11589350400\,t^9 - 634838431667200\,y^2 - \\
&816701453107200\,ty^2 - 493209885081600\,t^2y^2 - 446848653363200\,t^4y^2 - 33261917824000\,t^2y^4 - 181890396979200\,t^3y^2 - \\
&73715731660800\,ty^4 - 1337415067238400\,t - 71269647238400\,y^4 - 294790142361600\,t^4 - 777406906368000\,t^3 - \\
&3871845908480\,y^6 - 14406835322880\,t^6 - 77304976851520\,t^5 - 457275456\,t^{10} - 181096197120\,t^8 - \\
&1921301544960\,t^7 - 76168560640\,y^8 - 738197504\,y^{10} - 75582720\,t^9y^2 - 268738560\,t^7y^4 - 477757440\,t^5y^6 - \\
&424673280\,t^3y^8 - 150994944\,ty^{10} - 594406696550400)x + 8312979456000\,t^3y^4 + 57128420480\,ty^8 + \\
&944785337600\,t^6y^2 + 531441\,t^{12} + 193851015680\,t^3y^6 + 16777216\,y^{12} + 31177872\,t^{11} + 15091349760\,t^9 + \\
&356725556200000\,y^2 + 476127323750400\,ty^2 + 306263044915200\,t^2y^2 + 34104449433600\,t^4y^2 + 2903884431360\,ty^6 + \\
&6702698004480\,t^5y^2 + 971652464640\,t^2y^6 + 445805022412800\,t + 46939294924800\,y^4 + 145763794944000\,t^4 + \\
&334353766809600\,t^3 + 4160078479360\,y^6 + 9663121981440\,t^6 + 44218521354240\,t^5 + 869201280\,t^{10} + \\
&180122019840\,t^8 + 1543589498880\,t^7 + 27643399372800\,t^2y^4 + 123302471270400\,t^3y^2 + 53444660428800\,ty^4 + \\
&501530650214400\,t^2 + 1615881830400\,t^4y^4 + 23994040320\,t^4y^6 + 13212057600\,t^2y^8 + 18393661440\,t^6y^4 + \\
&6483317760\,t^8y^2 + 211328040960\,t^5y^4 + 94696973120\,t^7y^2 + 108045271040\,y^8 + 1677721600\,y^{10} + \\
&5668704\,t^{10}y^2 + 25194240\,t^8y^4 + 59719680\,t^6y^6 + 79626240\,t^4y^8 + 56623104\,t^2y^{10} + 277136640\,t^9y^2 + \\
&985374720\,t^7y^4 + 1751777280\,t^5y^6 + 1557135360\,t^3y^8 + 553648128\,ty^{10} + 198135565516800.
\end{aligned}
$$

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