

MATHEMATIK

Aufgabensammlung mit vollständigen Lösungen

Grundlagen II

Rechnen mit Termen

10

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Aufgaben

1.1 Terme

1.1.1 Addition (Subtraktion) von Termen

Folgende Terme sind zu vereinfachen (Achtung: Vorzeichen)

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1 $-4a - 5b + 2 - (-4a - 3b + 2)$

2 $5x + y - 5 - (4x - 6y - 9)$

3 $-a + 5b + 11 + (3a - b - 8)$

4 $-4a + 2b + 3 + (-2a - 2b + 9)$

5 $10 - (6a - b + 4)$

6 $-3a - 6b + 2 - (-5a + 4b + 1)$

7 $-5a^2 - 2b^2 - a + b + 5 + (-a^2 + 4b^2 - 6a + 4b + 2)$

8 $-4a^2 - 5b^2 - a + 3b - 1 + (4a - 5b)$

9 $-6x^2 + 5x - 4y + 7 - (-3x^2 - 4y^2 - 4x + y + 1)$

10 $2b - 1 - (-2a^2 + 3b^2 + 5a + 4)$

11 $-4a^2 + b^2 + a + 4b + 6 - (6)$

12 $-4y^2 - 5x - 6y + 5 + (5x^2 - 5y^2 - 5x + 9)$

13 $-3x^3 + y^3 + y^2 + x + 3y + 9 + (6x^3 + 5y^3 - 6x^2 + y^2 - 5x - 4y - 5)$

14 $-6a^3 + 6b^3 - 4a^2 - 4b^2 + 5a - 3b + 1 - (-2a^3 - b^3 + 5a^2 - b^2 + 3a - 2)$

15 $-2x^3 - 3y^3 + 6x^2 + 2y^2 - 4x + 3y + 2 - (x^3 - y^3 - 3x^2 - 5x - 4y - 4)$

16 $-2a^3 - 2b^3 + 3a^2 + 5b^2 - 5a - 5 + (6b^3 - 3a^2 + 5b^2 + 5a - 5b - 9)$

17 $4x^3 + 6y^3 + 2y^2 - 5x - 3y - 6 + (-3x^3 + 3x^2 + 4x + 4y - 1)$

18 $3a^3 + 3b^3 - 6a^2 + 5b^2 - 3a + 3b + 3 - (a^3 - 3b^3 - b^2 + a - 4b + 5)$

19 $-5a^4 - 5b^4 + a^3 + 3b^3 + 6a^2 - 4b^2 - 6a - 2b - 7 + (4a^4 - 4b^4 + 4a^3 - 2b^3 - 5a^2 + 2b^2 + 4a + 6b + 4)$

20 $3a^4 + 2b^4 - a^3 + b^3 + 5a^2 - 6b^2 + 11 + (-5a^4 - 3b^4 + 6b^3 + b^2 + 6a - 2b + 2)$

1.1.2 Addition (Subtraktion) von Termen

Folgende Terme sind zu vereinfachen (Achtung: Vorzeichen)

$$21 \quad -2a + 5b + 3 - (-6a + 3b + 8)$$

$$22 \quad 6a - 6b + 6 - (-5a + 5b - 6)$$

$$23 \quad 6a - 3b + 4 + (-3)$$

$$24 \quad 5a + 5b - 10 - (-a + 8)$$

$$25 \quad x + 2y + 3 + (y + 1)$$

$$26 \quad 6x + 4y - 8 + (-6x + 9)$$

$$27 \quad 2x - 2y + 2 + (-2x - 4y + 8)$$

$$28 \quad -4a - 4b + 2 - (-3a + 3b + 1)$$

$$29 \quad x + 2y - [x - y - 8 - (-3x - y - 5)]$$

$$30 \quad 4a + b + [6a + 2b + 6 + (4b + 8)]$$

$$31 \quad 5x + 4y - 2 + [-x + y - 1 - (3y - 3)]$$

$$32 \quad -1 + [4a + 2b + 1 + (4a + 4b + 3)]$$

$$33 \quad -5b - 2 + [4a + 5b - 3 + (6a + 2b - 6)]$$

$$34 \quad -3a + 1 + [-6a - 4b - 2 - (-5b - 6)]$$

$$35 \quad 3a + 6b + 1 + \{4a - 4b - 4 - [b + 2 + (2a + 2b - 12)]\}$$

$$36 \quad -4a + b + 2 + \{-5a - 6b + 11 + [-5a - 2b - 6 - (5a + 4b - 4)]\}$$

$$37 \quad -5y - 5 + \{-6x + 2 + [-4x + 9 - (6x)]\}$$

$$38 \quad -2a + 4b - 3 + \{-5a + 3b + 5 - [6a + 2b + 11 - (4a - 3b + 4)]\}$$

$$39 \quad -3y - 4 + \{6x + 2y + 2 - [5x - 4y + 10 - (x + 3y + 5)]\}$$

$$40 \quad x + y - 1 + \{-x + 6y - 8 - [-3x + 6y - 10 - (2x - 5y + 8)]\}$$

1.1.3 Multiplikation von Termen

Folgende Terme sind zu multiplizieren (Klammer beachten):

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$$41 \quad 7 \cdot \left[(1-7a^8) \cdot 4 a^6 + (8b^7-5) \cdot 10 b^3 + (2a^{14}-80b^{10}) \right]$$

$$42 \quad 4 \cdot \left[(7+3a^7) \cdot 10 a^3 + (1b^2+3) \cdot 2 b^5 + (3a^{10}-2b^7) \right]$$

$$43 \quad 6 \cdot \left[(9-4a^7) \cdot 10 a^{13} - (4b^9+3) \cdot 10 b^7 - (1a^{20}-40b^{16}) \right]$$

$$44 \quad 13 \cdot \left[(6-7a^9) \cdot 1 a^{10} - (5b^8-3) \cdot 5 b^4 + (7a^{19}+25b^{12}) \right]$$

$$45 \quad 8 \cdot \left[(3+8a^{13}) \cdot 7 a^5 + (13b^4+2) \cdot 9 b^4 + (13a^{18}-117b^8) \right]$$

$$46 \quad 10 \cdot \left[(2+13a^{13}) \cdot 8 a^7 + (6b^2-4) \cdot 6 b^3 + (7a^{20}-36b^5) \right]$$

$$47 \quad 6 \cdot \left[(10+7a^2) \cdot 2 a^{10} - (8b^3-1) \cdot 5 b^5 - (3a^{12}-40b^8) \right]$$

$$48 \quad 4 \cdot \left[(2+8a^4) \cdot 7 a + (9b^{13}+10) \cdot 1 b^6 - (13a^5+9b^{19}) \right]$$

$$49 \quad 1 \cdot \left[(4+6a^{10}) \cdot 8 a^5 - (4b^7+10) \cdot 6 b^5 - (13a^{15}-24b^{12}) \right]$$

$$50 \quad 10 \cdot \left[(1-8a^2) \cdot 3 a^{10} + (8b^6+5) \cdot 9 b^6 + (8a^{12}-72b^{12}) \right]$$

$$51 \quad 10 \cdot \left[(4+4a^8) \cdot 8 a^2 - (10b^6-13) \cdot 5 b^5 - (7a^{10}-50b^{11}) \right]$$

$$52 \quad 7 \cdot \left[(7+3a^8) \cdot 2 a^{13} + (10b+10) \cdot 2 b^8 + (8a^{21}-20b^9) \right]$$

$$53 \quad 8 \cdot \left[(5-1a^7) \cdot 9 a^{10} + (1b+3) \cdot 13 b^2 - (4a^{17}+13b^3) \right]$$

$$54 \quad 10 \cdot \left[(4-5a^9) \cdot 5 a - (9b^7+10) \cdot 4 b^9 + (5a^{10}+36b^{16}) \right]$$

$$55 \quad 13 \cdot \left[(7+3a^{10}) \cdot 7 a^4 - (3b^3-7) \cdot 3 b - (13a^{14}-9b^4) \right]$$

$$56 \quad 3 \cdot \left[(7+10a^2) \cdot 5 a - (4b^5+8) \cdot 8 b^5 - (7a^3-32b^{10}) \right]$$

$$57 \quad 9 \cdot \left[(5+2a^{13}) \cdot 2 a^{13} + (3b^6-6) \cdot 4 b^{13} + (1a^{26}-12b^{19}) \right]$$

$$58 \quad 5 \cdot \left[(10-13a^4) \cdot 5 a^7 + (3b^{13}-13) \cdot 13 b^8 + (1a^{11}-39b^{21}) \right]$$

1.1.4 Multiplikation von Binome

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Folgende Binome sind zu multiplizieren (Achtung: Vorzeichen):

59 $(-1 + 6x) \cdot (8 - 3x)$

68 $(-13x + 9) \cdot (x + 7)$

60 $(3 + 2x) \cdot (4 - 13x)$

69 $(-8x - 8) \cdot (6x - 8)$

61 $(-1 + 9x) \cdot (1 - 7x)$

70 $(5x + 9) \cdot (7x + 9)$

62 $(-6 + 6x) \cdot (-8 - 5x)$

71 $(-9x + 7) \cdot (13x - 2)$

63 $(13 + 9x) \cdot (6 - 2x)$

72 $(-2x + 9) \cdot (-2x + 9)$

64 $(13 + x) \cdot (3 + 3x)$

73 $(8x + 4) \cdot (4x + 5)$

65 $(13 - 9x) \cdot (-3 + 13x)$

74 $(-7x - 3) \cdot (-5x - 8)$

66 $(-4 - 9x) \cdot (-4 + 2x)$

75 $(-5 + 3axy) \cdot (6 - 8axy)$

67 $(-7x - 5) \cdot (5x - 7)$

76 $(-6 - 9axy) \cdot (-7 - 10axy)$

1.1.5 Quadrieren, Multiplizieren von Binome

Folgende Terme sind nur mit Hilfe der binomischen Formeln zu berechnen:

$$77 \quad (6x + 6)^2$$

$$87 \quad (x + 4y)^2$$

$$78 \quad (5x + 10)^2$$

$$88 \quad (8x + 7y)^2$$

$$79 \quad (4 + 4x)^2$$

$$89 \quad (8x + 6y^2)^2$$

$$80 \quad (5 - x)^2$$

$$90 \quad (x^2 - 8y)^2$$

$$81 \quad (7x - y)^2$$

$$91 \quad (2a - b)^2$$

$$82 \quad (9x - 9y)^2$$

$$92 \quad (3a^2 - 8b^2)^2$$

$$83 \quad (2a + 6b) \cdot (2a - 6b)$$

$$93 \quad (13a^3 + 2b^3) \cdot (13a^3 - 2b^3)$$

$$84 \quad (5a + 2b) \cdot (5a - 2b)$$

$$94 \quad (6a + 3b) \cdot (6a - 3b)$$

$$85 \quad (4x - 5y) \cdot (4x + 5y)$$

$$95 \quad (7b^4 - 9a^2) \cdot (7b^4 + 9a^2)$$

$$86 \quad (3x - 3y) \cdot (3x + 3y)$$

$$96 \quad (9b^4 - 8a^4) \cdot (9b^4 + 8a^4)$$

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1.1.6 Faktorisieren von Summen

Folgende Terme sind nur mit Hilfe der binomischen Formeln zu faktorisieren (Umwandlung in ein Produkt):

$$97 \quad 16x^2 + 48x + 36$$

$$107 \quad 49x^2 + 126xy + 81y^2$$

$$98 \quad 169x^2 + 260x + 100$$

$$108 \quad 100x^2 + 20xy + y^2$$

$$99 \quad 169x^2 + 104x + 16$$

$$109 \quad 9x^4 + 78x^2y^2 + 169y^4$$

$$100 \quad 100x^2 - 140x + 49$$

$$110 \quad 81x^2 - 126xy + 49y^2$$

$$101 \quad 4x^2 - 40xy + 100y^2$$

$$111 \quad 49a^4 - 42a^2b + 9b^2$$

$$102 \quad 36x^2 - 84xy + 49y^2$$

$$112 \quad 169b^4 - 130ab^2 + 25a^2$$

$$103 \quad a^2 - 100b^2$$

$$113 \quad 64a^4 - 25b^4$$

$$104 \quad 81a^2 - 49b^2$$

$$114 \quad -64b^6 + a^4$$

$$105 \quad 64x^2 - 81y^2$$

$$115 \quad 36b^8 - 36a^4$$

$$106 \quad -16y^4 + 49x^2$$

$$116 \quad 36b^6 - 4a^2$$

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Lösungen

2.1 Grundlagen

2.1.1 Addition (Subtraktion) von Termen

Folgende Terme sind zu vereinfachen (Achtung: Vorzeichen)

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$$\begin{aligned} 1 \quad & -4a - 5b + 2 - (-4a - 3b + 2) \\ & = -4a - 5b + 2 - (-4a - 3b + 2) = -4a - 5b + 2 + 4a + 3b - 2 = \underline{-2b} \end{aligned}$$

$$\begin{aligned} 2 \quad & 5x + y - 5 - (4x - 6y - 9) \\ & = 5x + y - 5 - (4x - 6y - 9) = 5x + y - 5 - 4x + 6y + 9 = \underline{x + 7y + 4} \end{aligned}$$

$$\begin{aligned} 3 \quad & -a + 5b + 11 + (3a - b - 8) \\ & = -a + 5b + 11 + (3a - b - 8) = -a + 5b + 11 + 3a - b - 8 = \underline{2a + 4b + 3} \end{aligned}$$

$$\begin{aligned} 4 \quad & -4a + 2b + 3 + (-2a - 2b + 9) \\ & = -4a + 2b + 3 + (-2a - 2b + 9) = -4a + 2b + 3 - 2a - 2b + 9 = \underline{-6a + 12} \end{aligned}$$

$$\begin{aligned} 5 \quad & 10 - (6a - b + 4) \\ & = 10 - (6a - b + 4) = 10 - 6a + b - 4 = \underline{-6a + b + 6} \end{aligned}$$

$$\begin{aligned} 6 \quad & -3a - 6b + 2 - (-5a + 4b + 1) \\ & = -3a - 6b + 2 - (-5a + 4b + 1) = -3a - 6b + 2 + 5a - 4b - 1 = \underline{2a - 10b + 1} \end{aligned}$$

$$\begin{aligned} 7 \quad & -5a^2 - 2b^2 - a + b + 5 + (-a^2 + 4b^2 - 6a + 4b + 2) \\ & = -5a^2 - 2b^2 - a + b + 5 + (-a^2 + 4b^2 - 6a + 4b + 2) = \\ & = -5a^2 - 2b^2 - a + b + 5 - a^2 + 4b^2 - 6a + 4b + 2 = \underline{-6a^2 + 2b^2 - 7a + 5b + 7} \end{aligned}$$

$$\begin{aligned}
 & \boxed{8} \quad -4a^2 - 5b^2 - a + 3b - 1 + (4a - 5b) \\
 & = -4a^2 - 5b^2 - a + 3b - 1 + (4a - 5b) = \\
 & = -4a^2 - 5b^2 - a + 3b - 1 + 4a - 5b = \underline{-4a^2 - 5b^2 + 3a - 2b - 1}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{9} \quad -6x^2 + 5x - 4y + 7 - (-3x^2 - 4y^2 - 4x + y + 1) \\
 & = -6x^2 + 5x - 4y + 7 - (-3x^2 - 4y^2 - 4x + y + 1) = \\
 & = -6x^2 + 5x - 4y + 7 + 3x^2 + 4y^2 + 4x - y - 1 = \underline{-3x^2 + 4y^2 + 9x - 5y + 6}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{10} \quad 2b - 1 - (-2a^2 + 3b^2 + 5a + 4) \\
 & = 2b - 1 - (-2a^2 + 3b^2 + 5a + 4) = \\
 & = 2b - 1 + 2a^2 - 3b^2 - 5a - 4 = \underline{2a^2 - 3b^2 - 5a + 2b - 5}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{11} \quad -4a^2 + b^2 + a + 4b + 6 - (6) \\
 & = -4a^2 + b^2 + a + 4b + 6 - (6) = \\
 & = -4a^2 + b^2 + a + 4b + 6 - 6 = \underline{-4a^2 + b^2 + a + 4b}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{12} \quad -4y^2 - 5x - 6y + 5 + (5x^2 - 5y^2 - 5x + 9) \\
 & = -4y^2 - 5x - 6y + 5 + (5x^2 - 5y^2 - 5x + 9) = \\
 & = -4y^2 - 5x - 6y + 5 + 5x^2 - 5y^2 - 5x + 9 = \underline{5x^2 - 9y^2 - 10x - 6y + 14}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{13} \quad -3x^3 + y^3 + y^2 + x + 3y + 9 + (6x^3 + 5y^3 - 6x^2 + y^2 - 5x - 4y - 5) \\
 & = -3x^3 + y^3 + y^2 + x + 3y + 9 + (6x^3 + 5y^3 - 6x^2 + y^2 - 5x - 4y - 5) = \\
 & = -3x^3 + y^3 + y^2 + x + 3y + 9 + 6x^3 + 5y^3 - 6x^2 + y^2 - 5x - 4y - 5 = \\
 & = \underline{3x^3 + 6y^3 - 6x^2 + 2y^2 - 4x - y + 4}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{14} \quad -6a^3 + 6b^3 - 4a^2 - 4b^2 + 5a - 3b + 1 - (-2a^3 - b^3 + 5a^2 - b^2 + 3a - 2) \\
 & = -6a^3 + 6b^3 - 4a^2 - 4b^2 + 5a - 3b + 1 - (-2a^3 - b^3 + 5a^2 - b^2 + 3a - 2) = \\
 & = -6a^3 + 6b^3 - 4a^2 - 4b^2 + 5a - 3b + 1 + 2a^3 + b^3 - 5a^2 + b^2 - 3a + 2 = \\
 & = \underline{-4a^3 + 7b^3 - 9a^2 - 3b^2 + 2a - 3b + 3}
 \end{aligned}$$

$$\begin{aligned}
15 \quad & -2x^3 - 3y^3 + 6x^2 + 2y^2 - 4x + 3y + 2 - (x^3 - y^3 - 3x^2 - 5x - 4y - 4) \\
& = -2x^3 - 3y^3 + 6x^2 + 2y^2 - 4x + 3y + 2 - (x^3 - y^3 - 3x^2 - 5x - 4y - 4) = \\
& = -2x^3 - 3y^3 + 6x^2 + 2y^2 - 4x + 3y + 2 - x^3 + y^3 + 3x^2 + 5x + 4y + 4 = \\
& = \underline{-3x^3 - 2y^3 + 9x^2 + 2y^2 + x + 7y + 6}
\end{aligned}$$

$$\begin{aligned}
16 \quad & -2a^3 - 2b^3 + 3a^2 + 5b^2 - 5a - 5 + (6b^3 - 3a^2 + 5b^2 + 5a - 5b - 9) \\
& = -2a^3 - 2b^3 + 3a^2 + 5b^2 - 5a - 5 + (6b^3 - 3a^2 + 5b^2 + 5a - 5b - 9) = \\
& = -2a^3 - 2b^3 + 3a^2 + 5b^2 - 5a - 5 + 6b^3 - 3a^2 + 5b^2 + 5a - 5b - 9 = \\
& = \underline{-2a^3 + 4b^3 + 10b^2 - 5b - 14}
\end{aligned}$$

$$\begin{aligned}
17 \quad & 4x^3 + 6y^3 + 2y^2 - 5x - 3y - 6 + (-3x^3 + 3x^2 + 4x + 4y - 1) \\
& = 4x^3 + 6y^3 + 2y^2 - 5x - 3y - 6 + (-3x^3 + 3x^2 + 4x + 4y - 1) = \\
& = 4x^3 + 6y^3 + 2y^2 - 5x - 3y - 6 - 3x^3 + 3x^2 + 4x + 4y - 1 = \\
& = \underline{x^3 + 6y^3 + 3x^2 + 2y^2 - x + y - 7}
\end{aligned}$$

$$\begin{aligned}
18 \quad & 3a^3 + 3b^3 - 6a^2 + 5b^2 - 3a + 3b + 3 - (a^3 - 3b^3 - b^2 + a - 4b + 5) \\
& = 3a^3 + 3b^3 - 6a^2 + 5b^2 - 3a + 3b + 3 - (a^3 - 3b^3 - b^2 + a - 4b + 5) = \\
& = 3a^3 + 3b^3 - 6a^2 + 5b^2 - 3a + 3b + 3 - a^3 + 3b^3 + b^2 - a + 4b - 5 = \\
& = \underline{2a^3 + 6b^3 - 6a^2 + 6b^2 - 4a + 7b - 2}
\end{aligned}$$

$$\begin{aligned}
19 \quad & -5a^4 - 5b^4 + a^3 + 3b^3 + 6a^2 - 4b^2 - 6a - 2b - 7 + (4a^4 - 4b^4 + 4a^3 - 2b^3 - 5a^2 + 2b^2 + 4a + 6b + 4) \\
& = -5a^4 - 5b^4 + a^3 + 3b^3 + 6a^2 - 4b^2 - 6a - 2b - 7 + (4a^4 - 4b^4 + 4a^3 - 2b^3 - 5a^2 + 2b^2 + 4a + 6b + 4) = \\
& = -5a^4 - 5b^4 + a^3 + 3b^3 + 6a^2 - 4b^2 - 6a - 2b - 7 + 4a^4 - 4b^4 + 4a^3 - 2b^3 - 5a^2 + 2b^2 + 4a + 6b + 4 = \\
& = \underline{-a^4 - 9b^4 + 5a^3 + b^3 + a^2 - 2b^2 - 2a + 4b - 3}
\end{aligned}$$

$$\begin{aligned}
20 \quad & 3a^4 + 2b^4 - a^3 + b^3 + 5a^2 - 6b^2 + 11 + (-5a^4 - 3b^4 + 6b^3 + b^2 + 6a - 2b + 2) \\
& = 3a^4 + 2b^4 - a^3 + b^3 + 5a^2 - 6b^2 + 11 + (-5a^4 - 3b^4 + 6b^3 + b^2 + 6a - 2b + 2) = \\
& = 3a^4 + 2b^4 - a^3 + b^3 + 5a^2 - 6b^2 + 11 - 5a^4 - 3b^4 + 6b^3 + b^2 + 6a - 2b + 2 = \\
& = \underline{-2a^4 - b^4 - a^3 + 7b^3 + 5a^2 - 5b^2 + 6a - 2b + 13}
\end{aligned}$$

2.1.2 Addition (Subtraktion) von Termen

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Folgende Terme sind zu vereinfachen (Achtung: Vorzeichen)

$$\begin{aligned} 21 \quad & -2a + 5b + 3 - (-6a + 3b + 8) \\ & = -2a + 5b + 3 - (-6a + 3b + 8) = -2a + 5b + 3 + 6a - 3b - 8 = \underline{4a + 2b - 5} \end{aligned}$$

$$\begin{aligned} 22 \quad & 6a - 6b + 6 - (-5a + 5b - 6) \\ & = 6a - 6b + 6 - (-5a + 5b - 6) = 6a - 6b + 6 + 5a - 5b + 6 = \underline{11a - 11b + 12} \end{aligned}$$

$$\begin{aligned} 23 \quad & 6a - 3b + 4 + (-3) \\ & = 6a - 3b + 4 + (-3) = 6a - 3b + 4 - 3 = \underline{6a - 3b + 1} \end{aligned}$$

$$\begin{aligned} 24 \quad & 5a + 5b - 10 - (-a + 8) \\ & = 5a + 5b - 10 - (-a + 8) = 5a + 5b - 10 + a - 8 = \underline{6a + 5b - 18} \end{aligned}$$

$$\begin{aligned} 25 \quad & x + 2y + 3 + (y + 1) \\ & = x + 2y + 3 + (y + 1) = x + 2y + 3 + y + 1 = \underline{x + 3y + 4} \end{aligned}$$

$$\begin{aligned} 26 \quad & 6x + 4y - 8 + (-6x + 9) \\ & = 6x + 4y - 8 + (-6x + 9) = 6x + 4y - 8 - 6x + 9 = \underline{4y + 1} \end{aligned}$$

$$\begin{aligned} 27 \quad & 2x - 2y + 2 + (-2x - 4y + 8) \\ & = 2x - 2y + 2 + (-2x - 4y + 8) = 2x - 2y + 2 - 2x - 4y + 8 = \underline{-6y + 10} \end{aligned}$$

$$\begin{aligned} 28 \quad & -4a - 4b + 2 - (-3a + 3b + 1) \\ & = -4a - 4b + 2 - (-3a + 3b + 1) = -4a - 4b + 2 + 3a - 3b - 1 = \underline{-a - 7b + 1} \end{aligned}$$

$$\begin{aligned} 29 \quad & x + 2y - [x - y - 8 - (-3x - y - 5)] \\ & = x + 2y - [x - y - 8 - (-3x - y - 5)] = x + 2y - [x - y - 8 + 3x + y + 5] = \\ & = x + 2y - [4x - 3] = x + 2y - 4x + 3 = \\ & = \underline{-3x + 2y + 3} \end{aligned}$$

$$\begin{aligned} 30 \quad & 4a + b + [6a + 2b + 6 + (4b + 8)] \\ & = 4a + b + [6a + 2b + 6 + (4b + 8)] = 4a + b + [6a + 2b + 6 + 4b + 8] = \\ & = 4a + b + [6a + 6b + 14] = 4a + b + 6a + 6b + 14 = \\ & = \underline{10a + 7b + 14} \end{aligned}$$

$$\begin{aligned} 31 \quad & 5x + 4y - 2 + [-x + y - 1 - (3y - 3)] \\ & = 5x + 4y - 2 + [-x + y - 1 - (3y - 3)] = 5x + 4y - 2 + [-x + y - 1 - 3y + 3] = \\ & = 5x + 4y - 2 + [-x - 2y + 2] = 5x + 4y - 2 - x - 2y + 2 = \\ & = \underline{4x + 2y} \end{aligned}$$

$$\begin{aligned} 32 \quad & -1 + [4a + 2b + 1 + (4a + 4b + 3)] \\ & = -1 + [4a + 2b + 1 + (4a + 4b + 3)] = -1 + [4a + 2b + 1 + 4a + 4b + 3] = \\ & = -1 + [8a + 6b + 4] = -1 + 8a + 6b + 4 = \\ & = \underline{8a + 6b + 3} \end{aligned}$$

$$\begin{aligned} 33 \quad & -5b - 2 + [4a + 5b - 3 + (6a + 2b - 6)] \\ & = -5b - 2 + [4a + 5b - 3 + (6a + 2b - 6)] = -5b - 2 + [4a + 5b - 3 + 6a + 2b - 6] = \\ & = -5b - 2 + [10a + 7b - 9] = -5b - 2 + 10a + 7b - 9 = \\ & = \underline{10a + 2b - 11} \end{aligned}$$

$$\begin{aligned} 34 \quad & -3a + 1 + [-6a - 4b - 2 - (-5b - 6)] \\ & = -3a + 1 + [-6a - 4b - 2 - (-5b - 6)] = -3a + 1 + [-6a - 4b - 2 + 5b + 6] = \\ & = -3a + 1 + [-6a + b + 4] = -3a + 1 - 6a + b + 4 = \\ & = \underline{-9a + b + 5} \end{aligned}$$

$$\begin{aligned}
\text{35} \quad & 3a + 6b + 1 + \left\{ 4a - 4b - 4 - \left[b + 2 + (2a + 2b - 12) \right] \right\} \\
& = 3a + 6b + 1 + \left\{ 4a - 4b - 4 - \left[b + 2 + (2a + 2b - 12) \right] \right\} = \\
& = 3a + 6b + 1 + \left\{ 4a - 4b - 4 - [b + 2 + 2a + 2b - 12] \right\} = 3a + 6b + 1 + \left\{ 4a - 4b - 4 - [2a + 3b - 10] \right\} = \\
& = 3a + 6b + 1 + \{ 4a - 4b - 4 - 2a - 3b + 10 \} = 3a + 6b + 1 + \{ 2a - 7b + 6 \} = \\
& = 3a + 6b + 1 + 2a - 7b + 6 = \underline{5a - b + 7}
\end{aligned}$$

$$\begin{aligned}
\text{36} \quad & -4a + b + 2 + \left\{ -5a - 6b + 11 + \left[-5a - 2b - 6 - (5a + 4b - 4) \right] \right\} \\
& = -4a + b + 2 + \left\{ -5a - 6b + 11 + \left[-5a - 2b - 6 - (5a + 4b - 4) \right] \right\} = \\
& = -4a + b + 2 + \left\{ -5a - 6b + 11 + [-5a - 2b - 6 - 5a - 4b + 4] \right\} = -4a + b + 2 + \left\{ -5a - 6b + 11 + [-10a - 6b - 2] \right\} = \\
& = -4a + b + 2 + \{ -5a - 6b + 11 - 10a - 6b - 2 \} = -4a + b + 2 + \{ -15a - 12b + 9 \} = \\
& = -4a + b + 2 - 15a - 12b + 9 = \underline{-19a - 11b + 11}
\end{aligned}$$

$$\begin{aligned}
\text{37} \quad & -5y - 5 + \left\{ -6x + 2 + \left[-4x + 9 - (6x) \right] \right\} \\
& = -5y - 5 + \left\{ -6x + 2 + \left[-4x + 9 - (6x) \right] \right\} = \\
& = -5y - 5 + \left\{ -6x + 2 + [-4x + 9 - 6x] \right\} = -5y - 5 + \left\{ -6x + 2 + [-10x + 9] \right\} = \\
& = -5y - 5 + \{ -6x + 2 - 10x + 9 \} = -5y - 5 + \{ -16x + 11 \} = \\
& = -5y - 5 - 16x + 11 = \underline{-16x - 5y + 6}
\end{aligned}$$

$$\begin{aligned}
\text{38} \quad & -2a + 4b - 3 + \left\{ -5a + 3b + 5 - \left[6a + 2b + 11 - (4a - 3b + 4) \right] \right\} \\
& = -2a + 4b - 3 + \left\{ -5a + 3b + 5 - \left[6a + 2b + 11 - (4a - 3b + 4) \right] \right\} = \\
& = -2a + 4b - 3 + \left\{ -5a + 3b + 5 - [6a + 2b + 11 - 4a + 3b - 4] \right\} = -2a + 4b - 3 + \left\{ -5a + 3b + 5 - [2a + 5b + 7] \right\} \\
& = -2a + 4b - 3 + \{ -5a + 3b + 5 - 2a - 5b - 7 \} = -2a + 4b - 3 + \{ -7a - 2b - 2 \} = \\
& = -2a + 4b - 3 - 7a - 2b - 2 = \underline{-9a + 2b - 5}
\end{aligned}$$

$$\begin{aligned}
\text{39} \quad & -3y - 4 + \left\{ 6x + 2y + 2 - \left[5x - 4y + 10 - (x + 3y + 5) \right] \right\} \\
& = -3y - 4 + \left\{ 6x + 2y + 2 - \left[5x - 4y + 10 - (x + 3y + 5) \right] \right\} = \\
& = -3y - 4 + \left\{ 6x + 2y + 2 - [5x - 4y + 10 - x - 3y - 5] \right\} = -3y - 4 + \left\{ 6x + 2y + 2 - [4x - 7y + 5] \right\} = \\
& = -3y - 4 + \{ 6x + 2y + 2 - 4x + 7y - 5 \} = -3y - 4 + \{ 2x + 9y - 3 \} = \\
& = -3y - 4 + 2x + 9y - 3 = \underline{2x + 6y - 7}
\end{aligned}$$

$$\begin{aligned} & \boxed{40} \quad x + y - 1 + \left\{ -x + 6y - 8 - \left[-3x + 6y - 10 - (2x - 5y + 8) \right] \right\} \\ & = x + y - 1 + \left\{ -x + 6y - 8 - \left[-3x + 6y - 10 - 2x + 5y - 8 \right] \right\} = \\ & = x + y - 1 + \left\{ -x + 6y - 8 - \left[-3x + 6y - 10 - 2x + 5y - 8 \right] \right\} = x + y - 1 + \left\{ -x + 6y - 8 - \left[-5x + 11y - 18 \right] \right\} = \\ & = x + y - 1 + \left\{ -x + 6y - 8 + 5x - 11y + 18 \right\} = x + y - 1 + \left\{ 4x - 5y + 10 \right\} = \\ & = x + y - 1 + 4x - 5y + 10 = \underline{\underline{5x - 4y + 9}} \end{aligned}$$

2.1.3 Multiplikation von Termen

11:35 **3**
2014-01-17

Folgende Terme sind zu multiplizieren (Klammer beachten):)

$$\begin{aligned}
 41 \quad & 7 \cdot \left[(1-7a^8) \cdot 4a^6 + (8b^7-5) \cdot 10b^3 + (2a^{14}-80b^{10}) \right] \\
 &= 7 \cdot \left[(4a^6-28a^{14}) + (80b^{10}-50b^3) + (2a^{14}-80b^{10}) \right] = \\
 &= 7 \cdot \left[-28a^{14} + 4a^6 + 80b^{10} - 50b^3 + 2a^{14} - 80b^{10} \right] = \\
 &= 7 \cdot \left[-26a^{14} + 4a^6 - 50b^3 \right] = \underline{-182a^{14} + 28a^6 - 350b^3}
 \end{aligned}$$

$$\begin{aligned}
 42 \quad & 4 \cdot \left[(7+3a^7) \cdot 10a^3 + (1b^2+3) \cdot 2b^5 + (3a^{10}-2b^7) \right] \\
 &= 4 \cdot \left[(70a^3+30a^{10}) + (2b^7+6b^5) + (3a^{10}-2b^7) \right] = \\
 &= 4 \cdot \left[30a^{10} + 70a^3 + 2b^7 + 6b^5 + 3a^{10} - 2b^7 \right] = \\
 &= 4 \cdot \left[33a^{10} + 6b^5 + 70a^3 \right] = \underline{132a^{10} + 24b^5 + 280a^3}
 \end{aligned}$$

$$\begin{aligned}
 43 \quad & 6 \cdot \left[(9-4a^7) \cdot 10a^{13} - (4b^9+3) \cdot 10b^7 - (1a^{20}-40b^{16}) \right] \\
 &= 6 \cdot \left[(90a^{13}-40a^{20}) - (40b^{16}+30b^7) - (1a^{20}-40b^{16}) \right] = \\
 &= 6 \cdot \left[-40a^{20} + 90a^{13} - 40b^{16} - 30b^7 - a^{20} + 40b^{16} \right] = \\
 &= 6 \cdot \left[-41a^{20} + 90a^{13} - 30b^7 \right] = \underline{-246a^{20} + 540a^{13} - 180b^7}
 \end{aligned}$$

$$\begin{aligned}
 44 \quad & 13 \cdot \left[(6-7a^9) \cdot 1a^{10} - (5b^8-3) \cdot 5b^4 + (7a^{19}+25b^{12}) \right] \\
 &= 13 \cdot \left[(6a^{10}-7a^{19}) - (25b^{12}-15b^4) + (7a^{19}+25b^{12}) \right] = \\
 &= 13 \cdot \left[-7a^{19} + 6a^{10} - 25b^{12} + 15b^4 + 7a^{19} + 25b^{12} \right] = \\
 &= 13 \cdot \left[6a^{10} + 15b^4 \right] = \underline{78a^{10} + 195b^4}
 \end{aligned}$$

$$\begin{aligned}
 45 \quad & 8 \cdot \left[(3+8a^{13}) \cdot 7a^5 + (13b^4+2) \cdot 9b^4 + (13a^{18}-117b^8) \right] \\
 &= 8 \cdot \left[(21a^5+56a^{18}) + (117b^8+18b^4) + (13a^{18}-117b^8) \right] = \\
 &= 8 \cdot \left[56a^{18} + 21a^5 + 117b^8 + 18b^4 + 13a^{18} - 117b^8 \right] = \\
 &= 8 \cdot \left[69a^{18} + 21a^5 + 18b^4 \right] = \underline{552a^{18} + 168a^5 + 144b^4}
 \end{aligned}$$

$$\begin{aligned}
46 \quad & 10 \cdot \left[(2 + 13a^{13}) \cdot 8 a^7 + (6b^2 - 4) \cdot 6 b^3 + (7a^{20} - 36b^5) \right] \\
&= 10 \cdot \left[(16a^7 + 104a^{20}) + (36b^5 - 24b^3) + (7a^{20} - 36b^5) \right] = \\
&= 10 \cdot [104 a^{20} + 16 a^7 + 36 b^5 - 24 b^3 + 7 a^{20} - 36 b^5] = \\
&= 10 \cdot [111 a^{20} + 16 a^7 - 24 b^3] = \underline{1110 a^{20} + 160 a^7 - 240 b^3}
\end{aligned}$$

$$\begin{aligned}
47 \quad & 6 \cdot \left[(10 + 7a^2) \cdot 2 a^{10} - (8b^3 - 1) \cdot 5 b^5 - (3a^{12} - 40b^8) \right] \\
&= 6 \cdot \left[(20a^{10} + 14a^{12}) - (40b^8 - 5b^5) - (3a^{12} - 40b^8) \right] = \\
&= 6 \cdot [14 a^{12} + 20 a^{10} - 40 b^8 + 5 b^5 - 3 a^{12} + 40 b^8] = \\
&= 6 \cdot [11 a^{12} + 20 a^{10} + 5 b^5] = \underline{66 a^{12} + 120 a^{10} + 30 b^5}
\end{aligned}$$

$$\begin{aligned}
48 \quad & 4 \cdot \left[(2 + 8a^4) \cdot 7 a + (9b^{13} + 10) \cdot 1 b^6 - (13a^5 + 9b^{19}) \right] \\
&= 4 \cdot \left[(14a + 56a^5) + (9b^{19} + 10b^6) - (13a^5 + 9b^{19}) \right] = \\
&= 4 \cdot [56 a^5 + 14 a + 9 b^{19} + 10 b^6 - 9 b^{19} - 13 a^5] = \\
&= 4 \cdot [10 b^6 + 43 a^5 + 14 a] = \underline{40 b^6 + 172 a^5 + 56 a}
\end{aligned}$$

$$\begin{aligned}
49 \quad & 1 \cdot \left[(4 + 6a^{10}) \cdot 8 a^5 - (4b^7 + 10) \cdot 6 b^5 - (13a^{15} - 24b^{12}) \right] \\
&= 1 \cdot \left[(32a^5 + 48a^{15}) - (24b^{12} + 60b^5) - (13a^{15} - 24b^{12}) \right] = \\
&= 1 \cdot [48 a^{15} + 32 a^5 - 24 b^{12} - 60 b^5 - 13 a^{15} + 24 b^{12}] = \\
&= 1 \cdot [35 a^{15} + 32 a^5 - 60 b^5] = \underline{35 a^{15} + 32 a^5 - 60 b^5}
\end{aligned}$$

$$\begin{aligned}
50 \quad & 10 \cdot \left[(1 - 8a^2) \cdot 3 a^{10} + (8b^6 + 5) \cdot 9 b^6 + (8a^{12} - 72b^{12}) \right] \\
&= 10 \cdot \left[(3a^{10} - 24a^{12}) + (72b^{12} + 45b^6) + (8a^{12} - 72b^{12}) \right] = \\
&= 10 \cdot [-24 a^{12} + 3 a^{10} + 72 b^{12} + 45 b^6 + 8 a^{12} - 72 b^{12}] = \\
&= 10 \cdot [-16 a^{12} + 3 a^{10} + 45 b^6] = \underline{-160 a^{12} + 30 a^{10} + 450 b^6}
\end{aligned}$$

$$\begin{aligned}
51 \quad & 10 \cdot \left[(4 + 4a^8) \cdot 8 a^2 - (10b^6 - 13) \cdot 5 b^5 - (7a^{10} - 50b^{11}) \right] \\
&= 10 \cdot \left[(32a^2 + 32a^{10}) - (50b^{11} - 65b^5) - (7a^{10} - 50b^{11}) \right] = \\
&= 10 \cdot [32 a^{10} + 32 a^2 - 50 b^{11} + 65 b^5 + 50 b^{11} - 7 a^{10}] = \\
&= 10 \cdot [25 a^{10} + 65 b^5 + 32 a^2] = \underline{250 a^{10} + 650 b^5 + 320 a^2}
\end{aligned}$$

$$\begin{aligned}
 52 \quad & 7 \cdot \left[(7 + 3a^8) \cdot 2 a^{13} + (10b + 10) \cdot 2 b^8 + (8a^{21} - 20b^9) \right] \\
 &= 7 \cdot \left[(14a^{13} + 6a^{21}) + (20b^9 + 20b^8) + (8a^{21} - 20b^9) \right] = \\
 &= 7 \cdot [6a^{21} + 14a^{13} + 20b^9 + 20b^8 + 8a^{21} - 20b^9] = \\
 &= 7 \cdot [14a^{21} + 14a^{13} + 20b^8] = \underline{98a^{21} + 98a^{13} + 140b^8}
 \end{aligned}$$

$$\begin{aligned}
 53 \quad & 8 \cdot \left[(5 - 1a^7) \cdot 9 a^{10} + (1b + 3) \cdot 13 b^2 - (4a^{17} + 13b^3) \right] \\
 &= 8 \cdot \left[(45a^{10} - 9a^{17}) + (13b^3 + 39b^2) - (4a^{17} + 13b^3) \right] = \\
 &= 8 \cdot [-9a^{17} + 45a^{10} + 13b^3 + 39b^2 - 4a^{17} - 13b^3] = \\
 &= 8 \cdot [-13a^{17} + 45a^{10} + 39b^2] = \underline{-104a^{17} + 360a^{10} + 312b^2}
 \end{aligned}$$

$$\begin{aligned}
 54 \quad & 10 \cdot \left[(4 - 5a^9) \cdot 5 a - (9b^7 + 10) \cdot 4 b^9 + (5a^{10} + 36b^{16}) \right] \\
 &= 10 \cdot \left[(20a - 25a^{10}) - (36b^{16} + 40b^9) + (5a^{10} + 36b^{16}) \right] = \\
 &= 10 \cdot [-25a^{10} + 20a - 36b^{16} - 40b^9 + 36b^{16} + 5a^{10}] = \\
 &= 10 \cdot [-20a^{10} - 40b^9 + 20a] = \underline{-200a^{10} - 400b^9 + 200a}
 \end{aligned}$$

$$\begin{aligned}
 55 \quad & 13 \cdot \left[(7 + 3a^{10}) \cdot 7 a^4 - (3b^3 - 7) \cdot 3 b - (13a^{14} - 9b^4) \right] \\
 &= 13 \cdot \left[(49a^4 + 21a^{14}) - (9b^4 - 21b) - (13a^{14} - 9b^4) \right] = \\
 &= 13 \cdot [21a^{14} + 49a^4 - 9b^4 + 21b - 13a^{14} + 9b^4] = \\
 &= 13 \cdot [8a^{14} + 49a^4 + 21b] = \underline{104a^{14} + 637a^4 + 273b}
 \end{aligned}$$

$$\begin{aligned}
 56 \quad & 3 \cdot \left[(7 + 10a^2) \cdot 5 a - (4b^5 + 8) \cdot 8 b^5 - (7a^3 - 32b^{10}) \right] \\
 &= 3 \cdot \left[(35a + 50a^3) - (32b^{10} + 64b^5) - (7a^3 - 32b^{10}) \right] = \\
 &= 3 \cdot [50a^3 + 35a - 32b^{10} - 64b^5 + 32b^{10} - 7a^3] = \\
 &= 3 \cdot [-64b^5 + 43a^3 + 35a] = \underline{-192b^5 + 129a^3 + 105a}
 \end{aligned}$$

$$\begin{aligned}
 57 \quad & 9 \cdot \left[(5 + 2a^{13}) \cdot 2 a^{13} + (3b^6 - 6) \cdot 4 b^{13} + (1a^{26} - 12b^{19}) \right] \\
 &= 9 \cdot \left[(10a^{13} + 4a^{26}) + (12b^{19} - 24b^{13}) + (1a^{26} - 12b^{19}) \right] = \\
 &= 9 \cdot [4a^{26} + 10a^{13} + 12b^{19} - 24b^{13} + a^{26} - 12b^{19}] = \\
 &= 9 \cdot [5a^{26} + 10a^{13} - 24b^{13}] = \underline{45a^{26} + 90a^{13} - 216b^{13}}
 \end{aligned}$$

$$\begin{aligned} 58 \quad & 5 \cdot \left[(10 - 13a^4) \cdot 5a^7 + (3b^{13} - 13) \cdot 13b^8 + (1a^{11} - 39b^{21}) \right] \\ &= 5 \cdot \left[(50a^7 - 65a^{11}) + (39b^{21} - 169b^8) + (1a^{11} - 39b^{21}) \right] = \\ &= 5 \cdot \left[-65a^{11} + 50a^7 + 39b^{21} - 169b^8 - 39b^{21} + a^{11} \right] = \\ &= 5 \cdot \left[-64a^{11} - 169b^8 + 50a^7 \right] = \underline{\underline{-320a^{11} - 845b^8 + 250a^7}} \end{aligned}$$

2.1.4 Multiplikation von Binome

11:35 4

2014-01-17

Folgende Binome sind zu multiplizieren (Achtung: Vorzeichen):)

$$59 \quad (-1 + 6x) \cdot (8 - 3x)$$

$$\begin{aligned} &= (-1 + 6x) \cdot (8 - 3x) = (-1 + 6x) \cdot 8 - (-1 + 6x) \cdot 3x = \\ &= -1 \cdot 8 + 6x \cdot 8 - (-1 \cdot 3x + 6x \cdot 3x) = 48x - 8 - (18x^2 - 3x) = \\ &= 48x - 8 - 18x^2 + 3x = \underline{-18x^2 + 51x - 8} \end{aligned}$$

$$60 \quad (3 + 2x) \cdot (4 - 13x)$$

$$\begin{aligned} &= (3 + 2x) \cdot (4 - 13x) = (3 + 2x) \cdot 4 - (3 + 2x) \cdot 13x = \\ &= 3 \cdot 4 + 2x \cdot 4 - (3 \cdot 13x + 2x \cdot 13x) = 8x + 12 - (26x^2 + 39x) = \\ &= 8x + 12 - 26x^2 - 39x = \underline{-26x^2 - 31x + 12} \end{aligned}$$

$$61 \quad (-1 + 9x) \cdot (1 - 7x)$$

$$\begin{aligned} &= (-1 + 9x) \cdot (1 - 7x) = (-1 + 9x) \cdot 1 - (-1 + 9x) \cdot 7x = \\ &= -1 \cdot 1 + 9x \cdot 1 - (-1 \cdot 7x + 9x \cdot 7x) = 9x - 1 - (63x^2 - 7x) = \\ &= 9x - 1 - 63x^2 + 7x = \underline{-63x^2 + 16x - 1} \end{aligned}$$

$$62 \quad (-6 + 6x) \cdot (-8 - 5x)$$

$$\begin{aligned} &= (-6 + 6x) \cdot (-8 - 5x) = (-6 + 6x) \cdot (-8) - (-6 + 6x) \cdot 5x = \\ &= -6 \cdot (-8) + 6x \cdot (-8) - (-6 \cdot 5x + 6x \cdot 5x) = 48x + 48 - (30x^2 - 30x) = \\ &= 48x + 48 - 30x^2 + 30x = \underline{-30x^2 - 18x + 48} \end{aligned}$$

$$63 \quad (13 + 9x) \cdot (6 - 2x)$$

$$\begin{aligned} &= (13 + 9x) \cdot (6 - 2x) = (13 + 9x) \cdot 6 - (13 + 9x) \cdot 2x = \\ &= 13 \cdot 6 + 9x \cdot 6 - (13 \cdot 2x + 9x \cdot 2x) = 54x + 78 - (18x^2 + 26x) = \\ &= 54x + 78 - 18x^2 - 26x = \underline{-18x^2 + 28x + 78} \end{aligned}$$

$$64 \quad (13 + x) \cdot (3 + 3x)$$

$$\begin{aligned} &= (13 + x) \cdot (3 + 3x) = (13 + x) \cdot 3 + (13 + x) \cdot 3x = \\ &= 13 \cdot 3 + x \cdot 3 + (13 \cdot 3x + x \cdot 3x) = 39 + 3x + (39x + 3x^2) = \\ &= 39 + 3x + 39x + 3x^2 = \underline{3x^2 + 42x + 39} \end{aligned}$$

$$\begin{aligned}
 65 \quad & (13-9x) \cdot (-3+13x) \\
 & = (13-9x) \cdot (-3+13x) = (13-9x) \cdot (-3) + (13-9x) \cdot 13x = \\
 & = 13 \cdot (-3) - 9x \cdot (-3) + (13 \cdot 13x - 9x \cdot 13x) = 27x - 39 + (-117x^2 + 169x) = \\
 & = 27x - 39 - 117x^2 + 169x = \underline{-117x^2 + 196x - 39}
 \end{aligned}$$

$$\begin{aligned}
 66 \quad & (-4-9x) \cdot (-4+2x) \\
 & = (-4-9x) \cdot (-4+2x) = (-4-9x) \cdot (-4) + (-4-9x) \cdot 2x = \\
 & = -4 \cdot (-4) - 9x \cdot (-4) + (-4 \cdot 2x - 9x \cdot 2x) = 36x + 16 + (-18x^2 - 8x) = \\
 & = 36x + 16 - 18x^2 - 8x = \underline{-18x^2 + 28x + 16}
 \end{aligned}$$

$$\begin{aligned}
 67 \quad & (-7x-5) \cdot (5x-7) \\
 & = (-7x-5) \cdot (5x-7) = (-7x-5) \cdot 5x - (-7x-5) \cdot 7 = \\
 & = -7x \cdot 5x - 5 \cdot 5x - (-7x \cdot 7 - 5 \cdot 7) = -35x^2 - 25x - (-49x - 35) = \\
 & = -35x^2 - 25x + 49x + 35 = \underline{-35x^2 + 24x + 35}
 \end{aligned}$$

$$\begin{aligned}
 68 \quad & (-13x+9) \cdot (x+7) \\
 & = (-13x+9) \cdot (x+7) = (-13x+9) \cdot x + (-13x+9) \cdot 7 = \\
 & = -13x \cdot x + 9 \cdot x + (-13x \cdot 7 + 9 \cdot 7) = -13x^2 + 9x + (-91x + 63) = \\
 & = -13x^2 + 9x - 91x + 63 = \underline{-13x^2 - 82x + 63}
 \end{aligned}$$

$$\begin{aligned}
 69 \quad & (-8x-8) \cdot (6x-8) \\
 & = (-8x-8) \cdot (6x-8) = (-8x-8) \cdot 6x - (-8x-8) \cdot 8 = \\
 & = -8x \cdot 6x - 8 \cdot 6x - (-8x \cdot 8 - 8 \cdot 8) = -48x^2 - 48x - (-64x - 64) = \\
 & = -48x^2 - 48x + 64x + 64 = \underline{-48x^2 + 16x + 64}
 \end{aligned}$$

$$\begin{aligned}
 70 \quad & (5x+9) \cdot (7x+9) \\
 & = (5x+9) \cdot (7x+9) = (5x+9) \cdot 7x + (5x+9) \cdot 9 = \\
 & = 5x \cdot 7x + 9 \cdot 7x + (5x \cdot 9 + 9 \cdot 9) = 35x^2 + 63x + (45x + 81) = \\
 & = 35x^2 + 63x + 45x + 81 = \underline{35x^2 + 108x + 81}
 \end{aligned}$$

$$\begin{aligned}
 71 \quad & (-9x+7) \cdot (13x-2) \\
 & = (-9x+7) \cdot (13x-2) = (-9x+7) \cdot 13x - (-9x+7) \cdot 2 = \\
 & = -9x \cdot 13x + 7 \cdot 13x - (-9x \cdot 2 + 7 \cdot 2) = -117x^2 + 91x - (-18x + 14) = \\
 & = -117x^2 + 91x + 18x - 14 = \underline{-117x^2 + 109x - 14}
 \end{aligned}$$

$$\boxed{72} \quad (-2x + 9) \cdot (-2x + 9)$$

$$\begin{aligned} &= (-2x + 9) \cdot (-2x + 9) = (-2x + 9) \cdot (-2x) + (-2x + 9) \cdot 9 = \\ &= -2x \cdot (-2x) + 9 \cdot (-2x) + (-2x \cdot 9 + 9 \cdot 9) = 4x^2 - 18x + (-18x + 81) = \\ &= 4x^2 - 18x - 18x + 81 = \underline{4x^2 - 36x + 81} \end{aligned}$$

$$\boxed{73} \quad (8x + 4) \cdot (4x + 5)$$

$$\begin{aligned} &= (8x + 4) \cdot (4x + 5) = (8x + 4) \cdot 4x + (8x + 4) \cdot 5 = \\ &= 8x \cdot 4x + 4 \cdot 4x + (8x \cdot 5 + 4 \cdot 5) = 32x^2 + 16x + (40x + 20) = \\ &= 32x^2 + 16x + 40x + 20 = \underline{32x^2 + 56x + 20} \end{aligned}$$

$$\boxed{74} \quad (-7x - 3) \cdot (-5x - 8)$$

$$\begin{aligned} &= (-7x - 3) \cdot (-5x - 8) = (-7x - 3) \cdot (-5x) - (-7x - 3) \cdot 8 = \\ &= -7x \cdot (-5x) - 3 \cdot (-5x) - (-7x \cdot 8 - 3 \cdot 8) = 35x^2 + 15x - (-56x - 24) = \\ &= 35x^2 + 15x + 56x + 24 = \underline{35x^2 + 71x + 24} \end{aligned}$$

$$\boxed{75} \quad (-5 + 3axy) \cdot (6 - 8axy)$$

$$\begin{aligned} &= (-5 + 3axy) \cdot (6 - 8axy) = (-5 + 3axy) \cdot 6 - (-5 + 3axy) \cdot 8axy = \\ &= -5 \cdot 6 + 3axy \cdot 6 - (-5 \cdot 8axy + 3axy \cdot 8axy) = 18axy - 30 - (24a^2x^2y^2 - 40axy) = \\ &= 18axy - 30 - 24a^2x^2y^2 + 40axy = \underline{-24a^2x^2y^2 + 58axy - 30} \end{aligned}$$

$$\boxed{76} \quad (-6 - 9axy) \cdot (-7 - 10axy)$$

$$\begin{aligned} &= (-6 - 9axy) \cdot (-7 - 10axy) = (-6 - 9axy) \cdot (-7) - (-6 - 9axy) \cdot 10axy = \\ &= -6 \cdot (-7) - 9axy \cdot (-7) - (-6 \cdot 10axy - 9axy \cdot 10axy) = 63axy + 42 - (-90a^2x^2y^2 - 60axy) = \\ &= 63axy + 42 + 90a^2x^2y^2 + 60axy = \underline{90a^2x^2y^2 + 123axy + 42} \end{aligned}$$

2.1.5 Quadrieren, Multiplizieren von Binome

Folgende Terme sind nur mit Hilfe der binomischen Formeln zu berechnen:

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$$\begin{aligned} 77 \quad (6x + 6)^2 \\ = \underbrace{(6x + 6)^2}_{(a+b)^2} = \underbrace{(6x)^2}_{a^2} + 2 \cdot \underbrace{6x \cdot 6}_{2ab} + \underbrace{(6)^2}_{b^2} = \underline{36x^2 + 72x + 36} \end{aligned}$$

$$\begin{aligned} 78 \quad (5x + 10)^2 \\ = \underbrace{(5x + 10)^2}_{(a+b)^2} = \underbrace{(5x)^2}_{a^2} + 2 \cdot \underbrace{5x \cdot 10}_{2ab} + \underbrace{(10)^2}_{b^2} = \underline{25x^2 + 100x + 100} \end{aligned}$$

$$\begin{aligned} 79 \quad (4 + 4x)^2 \\ = \underbrace{(4 + 4x)^2}_{(a+b)^2} = \underbrace{(4)^2}_{a^2} + 2 \cdot \underbrace{4 \cdot 4x}_{2ab} + \underbrace{(4x)^2}_{b^2} = \underline{16x^2 + 32x + 16} \end{aligned}$$

$$\begin{aligned} 80 \quad (5 - x)^2 \\ = \underbrace{(5 - x)^2}_{(a-b)^2} = \underbrace{(5)^2}_{a^2} - 2 \cdot \underbrace{5 \cdot x}_{2ab} + \underbrace{(x)^2}_{b^2} = \underline{x^2 - 10x + 25} \end{aligned}$$

$$\begin{aligned} 81 \quad (7x - y)^2 \\ = \underbrace{(7x - y)^2}_{(a-b)^2} = \underbrace{(7x)^2}_{a^2} - 2 \cdot \underbrace{7x \cdot y}_{2ab} + \underbrace{(y)^2}_{b^2} = \underline{49x^2 - 14xy + y^2} \end{aligned}$$

$$\begin{aligned} 82 \quad (9x - 9y)^2 \\ = \underbrace{(9x - 9y)^2}_{(a-b)^2} = \underbrace{(9x)^2}_{a^2} - 2 \cdot \underbrace{9x \cdot 9y}_{2ab} + \underbrace{(9y)^2}_{b^2} = \underline{81x^2 - 162xy + 81y^2} \end{aligned}$$

$$\begin{aligned} 83 \quad (2a + 6b) \cdot (2a - 6b) \\ = \underbrace{(2a + 6b) \cdot (2a - 6b)}_{(a+b) \cdot (a-b)} = \underbrace{(2a)^2}_{a^2} - \underbrace{(6b)^2}_{b^2} = \underline{4a^2 - 36b^2} \end{aligned}$$

$$\begin{aligned}
 & \boxed{84} \quad (5a + 2b) \cdot (5a - 2b) \\
 & = \underbrace{(5a + 2b) \cdot (5a - 2b)}_{(a+b) \cdot (a-b)} = \underbrace{(5a)^2}_{a^2} - \underbrace{(2b)^2}_{b^2} = \underline{25a^2 - 4b^2}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{85} \quad (4x - 5y) \cdot (4x + 5y) \\
 & = \underbrace{(4x - 5y) \cdot (4x + 5y)}_{(a-b) \cdot (a+b)} = \underbrace{(4x)^2}_{a^2} - \underbrace{(5y)^2}_{b^2} = \underline{16x^2 - 25y^2}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{86} \quad (3x - 3y) \cdot (3x + 3y) \\
 & = \underbrace{(3x - 3y) \cdot (3x + 3y)}_{(a-b) \cdot (a+b)} = \underbrace{(3x)^2}_{a^2} - \underbrace{(3y)^2}_{b^2} = \underline{9x^2 - 9y^2}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{87} \quad (x + 4y)^2 \\
 & = \underbrace{(x + 4y)^2}_{(a+b)^2} = \underbrace{x^2}_{a^2} + 2 \cdot \underbrace{x \cdot 4y}_{2ab} + \underbrace{(4y)^2}_{b^2} = \underline{x^2 + 8xy + 16y^2}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{88} \quad (8x + 7y)^2 \\
 & = \underbrace{(8x + 7y)^2}_{(a+b)^2} = \underbrace{(8x)^2}_{a^2} + 2 \cdot \underbrace{8x \cdot 7y}_{2ab} + \underbrace{(7y)^2}_{b^2} = \underline{64x^2 + 112xy + 49y^2}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{89} \quad (8x + 6y^2)^2 \\
 & = \underbrace{(8x + 6y^2)^2}_{(a+b)^2} = \underbrace{(8x)^2}_{a^2} + 2 \cdot \underbrace{8x \cdot 6y^2}_{2ab} + \underbrace{(6y^2)^2}_{b^2} = \underline{36y^4 + 96xy^2 + 64x^2}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{90} \quad (x^2 - 8y)^2 \\
 & = \underbrace{(x^2 - 8y)^2}_{(a-b)^2} = \underbrace{(x^2)^2}_{a^2} - 2 \cdot \underbrace{x^2 \cdot 8y}_{2ab} + \underbrace{(8y)^2}_{b^2} = \underline{x^4 - 16x^2y + 64y^2}
 \end{aligned}$$

$$\begin{aligned}
 & \boxed{91} \quad (2a - b)^2 \\
 & = \underbrace{(2a - b)^2}_{(a-b)^2} = \underbrace{(2a)^2}_{a^2} - 2 \cdot \underbrace{2a \cdot b}_{2ab} + \underbrace{(b)^2}_{b^2} = \underline{4a^2 - 4ab + b^2}
 \end{aligned}$$

$$\begin{aligned} 92 \quad & (3a^2 - 8b^2)^2 \\ &= \underbrace{(3a^2 - 8b^2)^2}_{(a-b)^2} = \underbrace{(3a^2)^2}_{a^2} - 2 \cdot \underbrace{3a^2 \cdot 8b^2}_{2ab} + \underbrace{(8b^2)^2}_{b^2} = \underline{9a^4 - 48a^2b^2 + 64b^4} \end{aligned}$$

$$\begin{aligned} 93 \quad & (13a^3 + 2b^3) \cdot (13a^3 - 2b^3) \\ &= \underbrace{(13a^3 + 2b^3) \cdot (13a^3 - 2b^3)}_{(a+b) \cdot (a-b)} = \underbrace{(13a^3)^2}_{a^2} - \underbrace{(2b^3)^2}_{b^2} = \underline{169a^6 - 4b^6} \end{aligned}$$

$$\begin{aligned} 94 \quad & (6a + 3b) \cdot (6a - 3b) \\ &= \underbrace{(6a + 3b) \cdot (6a - 3b)}_{(a+b) \cdot (a-b)} = \underbrace{(6a)^2}_{a^2} - \underbrace{(3b)^2}_{b^2} = \underline{36a^2 - 9b^2} \end{aligned}$$

$$\begin{aligned} 95 \quad & (7b^4 - 9a^2) \cdot (7b^4 + 9a^2) \\ &= \underbrace{(7b^4 - 9a^2) \cdot (7b^4 + 9a^2)}_{(a-b) \cdot (a+b)} = \underbrace{(7b^4)^2}_{a^2} - \underbrace{(9a^2)^2}_{b^2} = \underline{49b^8 - 81a^4} \end{aligned}$$

$$\begin{aligned} 96 \quad & (9b^4 - 8a^4) \cdot (9b^4 + 8a^4) \\ &= \underbrace{(9b^4 - 8a^4) \cdot (9b^4 + 8a^4)}_{(a-b) \cdot (a+b)} = \underbrace{(9b^4)^2}_{a^2} - \underbrace{(8a^4)^2}_{b^2} = \underline{-64a^8 + 81b^8} \end{aligned}$$

2.1.6 Faktorisieren von Summen

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Folgende Terme sind nur mit Hilfe der binomischen Formeln zu faktorisieren (Umwandlung in ein Produkt):

$$\begin{aligned}
 & \text{97} \quad 16x^2 + 48x + 36 \\
 & = \underbrace{(4x)^2}_{a^2} + 2 \cdot \underbrace{4x \cdot 6}_{2 \cdot a \cdot b} + \underbrace{(6)^2}_{b^2} = \underbrace{(4x + 6)^2}_{(a+b)^2} = (4x + 6)^2
 \end{aligned}$$

$$\begin{aligned}
 & \text{98} \quad 169x^2 + 260x + 100 \\
 & = \underbrace{(13x)^2}_{a^2} + 2 \cdot \underbrace{13x \cdot 10}_{2 \cdot a \cdot b} + \underbrace{(10)^2}_{b^2} = \underbrace{(13x + 10)^2}_{(a+b)^2} = (13x + 10)^2
 \end{aligned}$$

$$\begin{aligned}
 & \text{99} \quad 169x^2 + 104x + 16 \\
 & = \underbrace{(4)^2}_{a^2} + 2 \cdot \underbrace{4 \cdot 13x}_{2 \cdot a \cdot b} + \underbrace{(13x)^2}_{b^2} = \underbrace{(4 + 13x)^2}_{(a+b)^2} = (4 + 13x)^2
 \end{aligned}$$

$$\begin{aligned}
 & \text{100} \quad 100x^2 - 140x + 49 \\
 & = \underbrace{(7)^2}_{a^2} - 2 \cdot \underbrace{7 \cdot 10x}_{2 \cdot a \cdot b} + \underbrace{(10x)^2}_{b^2} = \underbrace{(7 - 10x)^2}_{(a-b)^2} = (7 - 10x)^2
 \end{aligned}$$

$$\begin{aligned}
 & \text{101} \quad 4x^2 - 40xy + 100y^2 \\
 & = \underbrace{(2x)^2}_{a^2} - 2 \cdot \underbrace{2x \cdot 10y}_{2 \cdot a \cdot b} + \underbrace{(10y)^2}_{b^2} = \underbrace{(2x - 10y)^2}_{(a-b)^2} = (2x - 10y)^2
 \end{aligned}$$

$$\begin{aligned}
 & \text{102} \quad 36x^2 - 84xy + 49y^2 \\
 & = \underbrace{(6x)^2}_{a^2} - 2 \cdot \underbrace{6x \cdot 7y}_{2 \cdot a \cdot b} + \underbrace{(7y)^2}_{b^2} = \underbrace{(6x - 7y)^2}_{(a-b)^2} = (6x - 7y)^2
 \end{aligned}$$

$$\begin{aligned}
 & \text{103} \quad a^2 - 100b^2 \\
 & = \underbrace{(a)^2}_{a^2} - \underbrace{(10b)^2}_{b^2} = \underbrace{(a + 10b) \cdot (a - 10b)}_{(a+b) \cdot (a-b)} = (a + 10b) \cdot (a - 10b)
 \end{aligned}$$

$$\begin{aligned}
 \text{104} \quad & 81a^2 - 49b^2 \\
 & = \underbrace{(9a)^2}_{a^2} - \underbrace{(7b)^2}_{b^2} = \underbrace{(9a + 7b) \cdot (9a - 7b)}_{(a+b) \cdot (a-b)} = \underline{(9a + 7b) \cdot (9a - 7b)}
 \end{aligned}$$

$$\begin{aligned}
 \text{105} \quad & 64x^2 - 81y^2 \\
 & = \underbrace{(8x)^2}_{a^2} - \underbrace{(9y)^2}_{b^2} = \underbrace{(8x - 9y) \cdot (8x + 9y)}_{(a-b) \cdot (a+b)} = \underline{(8x - 9y) \cdot (8x + 9y)}
 \end{aligned}$$

$$\begin{aligned}
 \text{106} \quad & -16y^4 + 49x^2 \\
 & = \underbrace{(7x)^2}_{a^2} - \underbrace{(4y^2)^2}_{b^2} = \underbrace{(7x - 4y^2) \cdot (7x + 4y^2)}_{(a-b) \cdot (a+b)} = \underline{(7x - 4y^2) \cdot (7x + 4y^2)}
 \end{aligned}$$

$$\begin{aligned}
 \text{107} \quad & 49x^2 + 126xy + 81y^2 \\
 & = \underbrace{(7x)^2}_{a^2} + 2 \cdot \underbrace{7x \cdot 9y}_{2 \cdot a \cdot b} + \underbrace{(9y)^2}_{b^2} = \underbrace{(7x + 9y)^2}_{(a+b)^2} = \underline{(7x + 9y)^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{108} \quad & 100x^2 + 20xy + y^2 \\
 & = \underbrace{(10x)^2}_{a^2} + 2 \cdot \underbrace{10x \cdot y}_{2 \cdot a \cdot b} + \underbrace{(y)^2}_{b^2} = \underbrace{(10x + y)^2}_{(a+b)^2} = \underline{(10x + y)^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{109} \quad & 9x^4 + 78x^2y^2 + 169y^4 \\
 & = \underbrace{(3x^2)^2}_{a^2} + 2 \cdot \underbrace{3x^2 \cdot 13y^2}_{2 \cdot a \cdot b} + \underbrace{(13y^2)^2}_{b^2} = \underbrace{(3x^2 + 13y^2)^2}_{(a+b)^2} = \underline{(3x^2 + 13y^2)^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{110} \quad & 81x^2 - 126xy + 49y^2 \\
 & = \underbrace{(9x)^2}_{a^2} - 2 \cdot \underbrace{9x \cdot 7y}_{2 \cdot a \cdot b} + \underbrace{(7y)^2}_{b^2} = \underbrace{(9x - 7y)^2}_{(a-b)^2} = \underline{(9x - 7y)^2}
 \end{aligned}$$

$$\begin{aligned}
 \text{111} \quad & 49a^4 - 42a^2b + 9b^2 \\
 & = \underbrace{(7a^2)^2}_{a^2} - 2 \cdot \underbrace{7a^2 \cdot 3b}_{2 \cdot a \cdot b} + \underbrace{(3b)^2}_{b^2} = \underbrace{(7a^2 - 3b)^2}_{(a-b)^2} = \underline{(7a^2 - 3b)^2}
 \end{aligned}$$

$$112 \quad 169b^4 - 130ab^2 + 25a^2$$

$$= \underbrace{(5a)^2}_{a^2} - 2 \cdot \underbrace{5a}_{2 \cdot a \cdot b} \cdot \underbrace{13b^2}_{b^2} + \underbrace{(13b^2)^2}_{(a-b)^2} = \underbrace{(5a - 13b^2)^2}_{(5a - 13b^2)^2}$$

$$113 \quad 64a^4 - 25b^4$$

$$= \underbrace{(8a^2)^2}_{a^2} - \underbrace{(5b^2)^2}_{b^2} = \underbrace{(8a^2 + 5b^2) \cdot (8a^2 - 5b^2)}_{(a+b) \cdot (a-b)} = \underline{(8a^2 + 5b^2) \cdot (8a^2 - 5b^2)}$$

$$114 \quad -64b^6 + a^4$$

$$= \underbrace{(a^2)^2}_{a^2} - \underbrace{(8b^3)^2}_{b^2} = \underbrace{(a^2 + 8b^3) \cdot (a^2 - 8b^3)}_{(a+b) \cdot (a-b)} = \underline{(a^2 + 8b^3) \cdot (a^2 - 8b^3)}$$

$$115 \quad 36b^8 - 36a^4$$

$$= \underbrace{(6b^4)^2}_{a^2} - \underbrace{(6a^2)^2}_{b^2} = \underbrace{(6b^4 - 6a^2) \cdot (6b^4 + 6a^2)}_{(a-b) \cdot (a+b)} = \underline{(6b^4 - 6a^2) \cdot (6b^4 + 6a^2)}$$

$$116 \quad 36b^6 - 4a^2$$

$$= \underbrace{(6b^3)^2}_{a^2} - \underbrace{(2a)^2}_{b^2} = \underbrace{(6b^3 - 2a) \cdot (6b^3 + 2a)}_{(a-b) \cdot (a+b)} = \underline{(6b^3 - 2a) \cdot (6b^3 + 2a)}$$