

Hoofdstuk 4

Vul de gegeven waarden in, in de gegeven algebraïsche uitdrukking en bereken het resultaat.

4.1

Substitueer $a = 3$

A.

$$2a^2 = 2x(3^2) = 18$$

B.

$$-a^2 + a = -(3^2) + 3 = -6$$

C.

$$4a^3 - 2a = 4x(3^3) - 2x3 = 4x27 - 2x3 = 102$$

D.

$$-3a^3 - 3a^2 = -3x(3^3) - 3x(3^2) = -3x27 - 3x9 = -108$$

E.

$$a(2a - 3) = 3((2x3) - 3) = 3x(6 - 3) = 9$$

4.2

Substitueer $a = -2$

A.

$$3a^2 = 3x(-2^2) = 12$$

B.

$$-a^3 + a = -(-2^3) - 2 = 8 - 2 = 6$$

C.

$$3(a^2 - 2a) = 3((-2^2) - (2x - 2)) = 3(4 - -4) = 3x8 = 24$$

D.

$$-2a^2 + a = -2x(-2^2) - 2 = (-2x4) - 2 = -10$$

E.

$$2a(-a + 3) = (2x - 2)x(- - 2 + 3) = -4x5 = -20$$

4.3

Substitueer $a = 4$

A.

$$3a^2 - 2a = (3x4^2) - (2x4) = 40$$

B.

$$-a^3 + 2a^2 = -(4^3) + (2x4^2) = -64 + 32 = -32$$

C.

$$-2(a^2 - 2a) = -2(4^2 - (2 \times 4)) = -2(16 - 8) = -16$$

D.

$$(2a - 4)(-a + 2) = ((2 \times 4) - 4)x(-4 + 2) = 4x - 2 = -8$$

E.

$$(3a - 4)^2 = ((3 \times 4) - 4)^2 = 8^2 = 64$$

4.4

Substitueer a = -3

A.

$$-a^2 + 2a = -(-3^2) + (2 \times -3) = -(9) + (-6) = -15$$

B.

$$a^3 - 2a^2 = (-3^3) - 2x(-3^2) = -27 - 2x(9) = -27 - 18 = -45$$

C.

$$-3(a^2 - 2a) = -3((-3^2) - (2 \times -3)) = -3(9 - -6) = -3 \times 15 = -45$$

D.

$$(2a - 1)(-3a + 2) = ((2 \times -3) - 1)x((-3 \times -3) + 2) = (-6 - 1)x(9 + 2) = -77$$

E.

$$(2a + 1)^2 = ((2 \times -3) + 1)^2 = (-6 + 1)^2 = -5^2 = 25$$

4.5

Substitueer a = 3 en b=2

A.

$$2a^2b = 2 \times 3^2 \times 2 = 36$$

B.

$$3a^2b^2 - 2ab = 3 \times 3^2 \times 2^2 - 2 \times 3 \times 2 = 108 - 12 = 96$$

C.

$$-3a^2b^3 + 2ab^2 = -3 \times 3^2 \times 2^3 + 2 \times 3 \times 2^2 = -216 + 24 = -192$$

D.

$$2a^3b - 3ab^3 = 2 \times 3^3 \times 2 - 3 \times 3 \times 2^3 = 108 - 72 = 36$$

E.

$$-5ab^2 - 2a^2 + 3b^3 = -5 \times 3 \times 2^2 - 2 \times 3^2 + 3 \times 2^3 = -60 - 18 + 24 = -54$$

4.6

Substitueer a = -2 en b = -3

A.

$$3ab - a = (3 \times -2 \times -3) - -2 = 18 + 2 = 20$$

B.

$$2a^2b - 2ab = (2x(-2^2)x - 3) - (2x - 2x - 3) = -24 - 12 = -36$$

C.

$$-3ab^2 + 3ab = (-3x - 2x(-3^2)) + (3x - 2x - 3) = -24 - 12 = 54 + 18 = 72$$

D.

$$a^2b^2 - 2a^2b + ab^2 = ((-2^2)x(-3^2)) - (2x(-2^2)x - 3) + (-2x(-3^2)) = 36 - -24 + -18 = 42$$

E.

$$-a^2 + b^2 + 4ab = -(-2^2) + (-3^2) + (4x - 2x - 3) = -4 + 9 + 24 = 29$$

4.7

Substitueer a = 5 en b = -2

A.

$$3(ab)^2 - 2ab = 3(5x - 2)^2 - (2x5x - 2) = 3x(-10^2) - -20 = 320$$

B.

$$a(a + b)^2 - 2(a)^2 = 5(5 - 2)^2 - (2x5)^2 = 5x9 - 100 = -55$$

C.

$$-3ab(a + 2b)^2 = (-3x5x - 2)x(5 + (2x - 2))^2 = 30x(1^2) = 30$$

D.

$$3a(a - 2b)(a^2 - 2ab) = 3x5x(5 - (2x - 2))x(5^2 - (2x5x - 2)) = 15x(5 - -4)x(25 - -20) = 15x9x45 = 6075$$

E.

$$(a^2b - 2ab^2)^2 = ((5^2x - 2) - (2x5x(-2^2)))^2 = (-50 - 40)^2 = 8100$$

4.8

Substitueer a = -2 en b = -1

a. $-((-2)^2 * -1)^3 - 2(-2 * (-1)^2)^2 = (-4 * -1)^3 - 2(-2)^2 = 64 - 8 = 56$

b. $-1(3(-2)^2 - 2 * -1)^2 = 1 * (12 + 2)^2 = 144 + 12 * 2 + 12 * 2 + 4 = 196$

c. $(3(-2)^2 * -1 - 2 * -2 * (-1)^2) * (2(-2)^2 - (-1)^2) = (-12 + 4) * (8 - 1) = -56$

d. $((-2)^2 + (-1)^2) * ((-2)^2 - (-1)^2) = (4 + 1) * (4 - 1) = 15$

e. $((-(-2)^2 * -1 + 2 * -1) * (-2(-1)^2 - 2 * -2))^2 = ((4 + -2) * (-2 - -4))^2 = (2 * 2)^2 = 16$

Rekenen met machten

4.9

- a. $a^{3+5} = a^8$
- b. $b^{3+2} = b^5$
- c. $a^{4+7} = a^{11}$
- d. $b^{1+3} = b^4$
- e. $a^{7+7} = a^{14}$

4.10

- a. $a^{2*3} = a^6$
- b. $b^{3*4} = b^{12}$
- c. $a^{5*5} = a^{25}$
- d. $b^{4*2} = b^8$
- e. $a^{6*9} = a^{54}$

4.11

- a. $a^4 * b^4 = a^4 b^4$
- b. $a^{2*2} * b^{3*2} = a^4 b^6$
- c. $a^{4*3} * b^3 = a^{12} b^3$
- d. $a^{2*4} * b^{3*4} = a^8 b^{12}$
- e. $a^{3*5} * b^{4*5} = a^{15} b^{20}$

4.12

- a. $a^{4+3+1} = a^8$
- b. $2 * 3 * a^{5+5} = 6a^{10}$
- c. $4 * 3 * 5 * a^{2+2+2} = 60a^6$
- d. $5 * 6 * 7 * a^{3+4+1} = 210a^8$
- e. $2 * 3 * a^{1+2+3} = 6a^6$

4.13

- a. $2^3 * a^{2*3} = 8a^6$
- b. $3^4 * a^{3*4} * b^{4*4} = 81a^{12} b^{16}$
- c. $4^2 * a^{2*2} * b^{2*2} = 16a^4 b^4$
- d. $5^3 * a^{5*3} * b^{3*3} = 125a^{15} b^9$
- e. $2^4 * a^{1*4} * b^{3*3} = 16a^4 b^{20}$

4.14

- a. $3 * 5 * a^{2+1} * b^{1+4} = 15a^3 b^5$
- b. $6 * 4 * a^{3+6} * b^{4+2} = 24a^9 b^6$
- c. $3 * 2 * a^{2+3} * b^{2+3} = 6a^5 b^5$
- d. $7 * 5 * a^{5+7} * b^{3+5} = 35a^{12} b^8$
- e. $8 * 3 * 6 * a^{2+1+5} * b^{4+2+4} = 144a^8 b^{10}$

4.15

- a. $3 * -2 * -4 * a^{2+3+5} = 24a^{10}$
- b. $-5 * 2 * -4 * 3 * a^{3+2+3+2} = 120a^{10}$
- c. $4 * -2 * -5 * a^{2+4+5} = 40a^{11}$
- d. $2 * -3 * -3 * a^{4+5+6} = 18a^{15}$
- e. $-3 * -2 * -4 * a^{2+4+1} = -24a^7$

4.16

- $-2^3 * a^{2*3} = -8a^6$
- $-3^2 * a^{3*2} = 9a^6$
- $-5^4 * a^{4*4} = 625a^{16}$
- $-1^5 * a^{2*5} * b^{4*5} = -a^{10}b^{20}$
- $-2^7 * a^{3*7} * b^{5*7} = -128a^{21}b^{35}$

4.17

- $3a^2 * 2^2 * a^{3*2} = 3 * 4 * a^{2+3*2} = 12a^8$
- $-3^2 * a^{3*2} * 2^3 * a^{2*3} = 9 * a^{3*2+3+2*3} = 72a^{12}$
- $3^3 * a^{4*3} * -5 * a^6 = 27 * -5 * a^{4*3+6} = -135a^{18}$
- $2a^2 * 5^3 * a^{3*3} * 3a^5 = 2 * 3 * 125 * a^{3*3+5} = 750a^{16}$
- $-2a^5 * -2^5 * a^5 * 5a^2 = -2 * -32 * 5 * a^{5+5+2} = 320a^{12}$

4.18

- $2 * a^3b^4 * -3^2 * a^{2*2} * b^{3*2} = 2 * 9 * a^{3+2*2} * b^{4+3*2} = 18a^7b^{10}$
- $-2^3 * a^{2*3} * b^{4*3} * -3^2 * a^{2*2} * b^{5*2} = -8 * 9 * a^{2*3+2*2} * b^{4*3+5*2} = -72a^{10}b^{22}$
- $2a^2b * -2^2 * a^{2*2} * b^{2*1} * -2^3 * a^{2*3} * b^{3*1} = 2 * 4 * -8 * a^{2+2*2+2*3} * b^{1+2*1+3*1} = -64a^{12}b^6$
- $3 * a^4b^2 * (-3)^3 * a^{2*3} * b^{4*3} * (-2)^2 * a^{3*2} * b^{2*2} = 3 * -27 * 4 * a^{4+2*3+3*2} * b^{2+4*3+2*2} = -324a^{16}b^{18}$
- $2^4 * a^{3*4} * (-3)^2 * b^{2*2} * 2^3 * a^{2*3} * b^{3*3} = 16 * 8 * 9 * a^{3*4+2*3} * b^{2*2+3*3} = 1152a^{18}b^{13}$

4.19

- $3^2 * a^{2*2} * b^{3*2} * c^{4*2} * 2^3 * a^3 * b^{2*3} * c^{3*3} = 9 * 8 * a^{2*2+3} * b^{3*2+2*3} * c^{4*2+3*3} = 72a^7b^{12}c^{17}$
- $(-2)^2 * a^{3*2} * c^{4*2} * (-1)^3 * a^{2*3} * b^{3*3} * 2^4 * b^{3*4} * c^{2*4} = 4 * -1 * 16 * a^{3*2+2*3} * b^{3*3+3*4} * c^{4*2+2*4} = -64a^{12}b^{21}c^{16}$
- $2 * a^2 * c^3 * 3^4 * a^{3*4} * b^{2*4} * c^4 * (-5) * a * b^2 * c^5 = 2 * -5 * 81 * a^{2+3*4+1} * b^{2*4+2} * c^{3+4+5} = -810a^{15}b^{10}c^{12}$
- $(-2)^6 * a^{3*6} * c^6 * 5^2 * a^{3*2} * b^{2*2} * (-5)^4 * b^{3*4} * c^{4*4} = 64 * 625 * 25 * a^{3*6+3*2} * b^{2*2+3*4} * c^{6+4*4} = 1000000 * a^{24}b^{16}c^{22}$
- $(-1) * (-3)^3 * a^{2*3} * b^{2*3} * c^{2*3} * (-2)^2 * a^{3*2} * b^{3*2} * c^{3*2} = -1 * -27 * 4 * a^{2*3+3*2} * b^{2*3+3*2} * c^{2*3+3*2} = 108a^{12}b^{12}c^{12}$

4.20

- $a^{3*4*3} = a^{36}$
- $((-1)^3 * a^{2*3} * 2^2 * a^{3*2})^2 = ((-1) * a^6 * 4 * a^6)^2 = (-1)^2 * a^{6*2} * 4^2 * a^{6*2} = 16a^{24}$
- $(2^2 * a^{2*2} * b^{3*2} * (-3)^3 * a^{3*3} * b^{2*3})^2 = (4 * -27 * a^{2*2+3*3} * b^{3*2+2*3})^2 = 4^2 * (-27)^2 * a^{13*2} * b^{12*2} = 11664a^{26}b^{24}$
- $(-2)^5 * a^{1*5} * (-1)^{2*5} * a^{3*2*5} = -32 * 1 * a^{30+5} = -32a^{35}$
- $(-2)^2 * (-1)^{3*2} * a^{2*3*2} * (-3)^3 * (-1)^{2*3} * a^{4*2*3} = 4 * 1 * -27 * 1 * a^{12} * a^{24} = -108a^{36}$

4.21

- $3 * 2 * a + 3 * 5 = 6a + 15$
- $8 * 5 * a - 8 * 2 = 40a - 16$
- $(-5) * 3 * a - 5 * 2 = -15a + 10$
- $12 * (-5) * a + 12 * 1 = -60a + 12$
- $(-7) * 7 * a + (-7) * 6 = -49a - 42$

4.22

- a. $2 * a * a - 2 * a * 5 = 2a^2 - 10a$
- b. $7 * a * 2 * a + 7 * a * 12 = 14a^2 + 84a$
- c. $(-13) * a * 9 * a - 13 * a * 5 = -117a^2 + 65a$
- d. $8 * a * 8 * a - 8 * a * 15 = 64a^2 - 120a$
- e. $(-21) * a * 3 * a + (-21) * a * 9 = -63a^2 - 189a$

4.23

Vanaf hier plaats ik geen vermenigvuldigingstekens () meer tussen cijfers en letters. Alleen nog tussen twee cijfers die vermenigvuldigd worden.*

- a. $2a * a^2 + 2a * 9 = 2a^{1+2} + 18a = 2a^3 + 18a$
- b. $3a^2 * 4a - 3a^2 * 7 = 12a^{2+1} - 21a^2 = 12a^3 - 21a^2$
- c. $-5a^2 * 2a^2 + -5a^2 * 4 = -10a^{2+2} - 20a^2 = -10a^4 - 20a^2$
- d. $9a^2 * a^2 + 9a^2 * 2a = 9a^{2+2} + 18a^{2+1} = 9a^4 + 18a^3$
- e. $-3a * a^2 - -3a * 4a = -3a^{1+2} + 12a^{1+1} = -3a^3 + 12a^2$

4.24

- a. $4a^2 * 3a^2 + 4a^2 * 2a + 4a^2 * 3 = 12a^{2+2} + 8a^{2+1} + 12a^2 = 12a^4 + 8a^3 + 12a^2$
- b. $-3a^2 * 2a^3 + -3a^2 * 5a^2 - -3a^2 * a = -3 * 2a^{2+3} - 3 * 5a^{2+2} + 3a^{2+1} = -6a^5 - 15a^4 + 3a^3$
- c. $7a^3 * 2a^2 + 7a^3 * 3a + 7a^3 * -6 = 7 * 2a^{3+2} + 7 * 3a^{3+1} - 6 * 7a^3 = 14a^5 + 21a^4 - 42a^3$
- d. $12a^2 * -6a^3 + 12a^2 * -2a^2 + 12a^2 * a + 12a^2 * -1 = -6 * 12a^{2+3} + -2 * 12a^{2+2} + 12a^{2+1} + -1 * 12a^2 = -72a^5 - 24a^4 + 12a^3 - 12a^2$
- e. $-5a^2 * 3a^4 + -5a^2 * a^2 + -2 * -5a^2 = -15a^{2+4} - 5a^{2+2} + (2 * 5)a^2 = -15a^6 - 5a^4 + 10a^2$

4.25

- a. $2 * 3a + 2 * 4b = 6a + 8b$
- b. $-5 * 2a - -5 * 5b = -10a + 25b$
- c. $2a * a + 2a * 2b = 2a^2 + 4ab$
- d. $16a * -4a + 16a * 6b = -64a^2 + 96ab$
- e. $-22a * 8a + 22a * 11b = -176a^2 + 242ab$

4.26

- a. $3a * 9a + 3a * 5b - 3a * 12 = 27a^2 + 15ab - 36a$
- b. $2a^2 * 7a - 2a^2 * 6b = 14a^3 - 12a^2b$
- c. $-8a^2 * 7a + -8a^2 * 4b + -8a^2 * -1 = -8 * 7 * a^{2+1} - 8 * 4 * a^2 * b - 8 * -1 * a^2 = -56a^3 - 32a^2b + 8a^2$
- d. $6a^2 * -2a + 6a^2 * 2b + 6a^2 * 2 = -12a^3 + 12a^2b + 12a^2$
- e. $-13a^2 * 13a + -13a^2 * 12b + -13a^2 * -14 = -13 * 13a^{2+1} - 156a^2b + (-13 * -14)a^2 = -169a^3 - 156a^2b + 182a^2$

4.27

- a. $2a^2 * 3a^2 + 2a^2 * 2b - 2a^2 * 3 = 6a^4 + 4a^2b - 6a^2$
- b. $(-5)a^3 * 2a^2 + (-5)a^3 * a - 5a^3 * 2b = (-5) * 2 * a^{3+2} + (-5) * a^{3+1} - 5 * 2 * a^3 * b = -10a^5 - 5a^4 + 10a^3b$
- c. $2b^2 * 3a^2 + 2b^2 * 2b^2 = 6a^2b^2 + 4b^4$
- d. $4a^3 * (-2)a^2 + 4a^3 * 5b^2 - 4a^3 * 2b = -8a^5 + 20a^3b^2 - 8a^3b$
- e. $(-14)b^3 * 14a^2 + (-14)b^3 * 2a - 14a^3 * 5b^2 = -196a^2b^3 - 28ab^3 + 70b^5$

4.28

- a. $2a^2 * a^2 + 2a^2 * 3ab = 2a^{2+2} + 2 * 3 * a^{2+1}b = 2a^4 + 6a^3b$
 b. $(-5)a^2 * 3a^2 + (-5)a^2 * 2ab - 5a^2 * 3b^2 = -15a^{2+2} - 10a^{2+1}b - 15a^2b^2 = -15a^4 - 10a^3b + 15a^2b^2$
 c. $2a^3 * 3a^3 + 2a^3 * 2a^2b^2 - b^2 * 2a^3 = 6a^{3+3} + 4a^{3+2}b^2 - 2a^3b^2 = 6a^6 + 4a^5b^2 - 2a^3b^2$
 d. $(-3)a^4 * 2a^3 + 2a^2b^2 * (-3)a^4 + 2ab^2 * (-3)a^4 = -3 * 2 * a^{4+3} + 2 * -3 * a^{2+4}b^2 + 2 * -3 * a^{4+1}b^2 = -6a^7 - 6a^6b^2 - 6a^5b^2$
 e. $7a^3 * (-7)a^3 + 7a^3 * 3a^2b - 4ab^2 * 7a^3 = -7 * 7 * a^{3+3} + 7 * 3 * a^{3+2}b - 7 * 4 * a^{3+1}b^2 = -49a^6 + 21a^5b - 28a^4b^2$

4.29

- a. $2ab * a^2 + 2ab * 2ab - 2ab * b^2 = 2a^{2+1}b + 2 * 2 * a^{1+1}b^{1+1} - 2ab^{2+1} = 2a^3b + 4a^2b^2 - 2ab^3$
 b. $(-5) * (-3) * a^{2+1} * b^{1+1} + 2 * (-5) * a^{1+1} * b^{2+1} - (-5) * 6 * a * b^{1+1} = 15a^3b^2 - 10a^2b^3 + 30ab^2$
 c. $6 * 2 * a^{2+1} * b^{2+1} - 5 * 6 * a^{1+1}b^{2+1} - 6ab^{2+2} = 12a^3b^3 - 30a^2b^3 - 6ab^4$
 d. $(-12) * (-12) * a^{2+2} * b^{2+2} + (-12) * 6 * a^{2+1}b^{2+1} - 12 * (-12)a^2b^2 = 144a^4b^4 - 72a^3b^3 + 144a^2b^2$
 e. $6 * 2 * a^{1+2}b^{2+1} + 6 * 9 * a^{1+1} * b^{2+1} - 6 * a^{1+1} * b^{2+2} = 12a^3b^3 + 54a^2b^3 - 6a^2b^4$

4.30

- a. $(-5) * a^{3+2} * b^{2+3} + 2 * a^{3+2} * b^{2+2} - a^{3+1} * b^{3+2} = -5a^5b^5 + 2a^5b^4 - a^4b^5$
 b. $(-1) * (-1) * a^{2+3} * b^{3+2} - 1 * -1 * a^{2+2} * b^{3+1} - 14 * (-1) * a^2b^3 = a^5b^5 + a^4b^4 + 14a^2b^3$
 c. $(-1) * 15 * a^{4+3} * b^{4+3} - 6 * 15 * a^{4+2} * b^{3+3} + 15 * a^{4+1} * b^{4+3} = -15a^7b^7 - 90a^6b^6 + 15a^5b^7$
 d. $(-1) * 13 * a^{5+4}b^{4+5} - 12 * (-1) * a^{5+2} * b^{4+3} + 9 * (-1) * a^{5+1} * b^{4+5} = -13a^9b^9 + 12a^7b^7 - 9a^6b^9$
 e. $(-7) * 7 * a^{3+2} * b^2 - 7 * 7 * a^{2+1} * b^{2+2} - 1 * 7 * a^2 * b^2 = -49a^5b^2 - 49a^3b^4 - 7a^2b^2$

4.31

- a. $2a * a + 2a * 6 - 4 * a + 2 * (-4) = 2a^2 + 12a - 4a - 8 = 2a^2 + 8a - 8$
 b. $-4a * 3a + (-4)a * 6 + 2 * a - 3 * 2 = -12a^2 + (-24)a + 2a - 6 = -12a^2 - 24a + 2a - 6 = -12a^2 - 22a - 6$
 c. $7a * (-2)a - 1 * 7a - 2a * (-7a) + 1 * (-2a) = -14a^2 - 7a + 14a^2 - 2a = -9a$
 d. $(-8)a * a - 8 * (-8)a - 2 * (-a) + 5 * (-2) = -8a^2 - 64a - (-2a) + (-10) = -8a^2 + 64a + 2a - 2 = -8a^2 + 66a - 10$
 e. $5a * 2a - 5 * 5a + 5 * 2a - 1 * 5 = 10a^2 - 25a + 10a - 5 = 10a^2 - 15a - 5$
 f. $(-2) * a * a + 1 * (-2) * a - 1 * a - 1 * (-1) = -2a^2 + (-2a) - a - (-1) = -2a^2 - 2a - a + 1 = -2a^2 - 3a + 1$

4.32

- a. $3a * a + 3a * 2b - b * (-2a) + 2 * (-b) = 3a^2 + 6ab - (-2ab) + (-2b) = 3a^2 + 6ab + 2ab - 2b = 3a^2 + 8ab - 2b$
- b. $-a * a - b * (-a) + b * (-a) + 1 * b = -a^2 - ab + (-2b) + b = -a^2 + ab - ab + b = -a^2 + b$
- c. $2a * 2a + 2a * b - 2b * (-a) + b * (-2b) - 2 * a - b * (-2) = 4a^2 + 2ab - (-2ab) + (-2b^2) - 2a - (-2b) = 4a^2 + 2ab + 2ab - 2b^2 - 2a + 2b = 4a^2 + 4ab - 2b^2 - 2a + 2b$
- d. $(-b) * (-a) + 2b * (-b) + 3 * 2a - 3b - a * 2a - a * b = ab - 2b^2 + 6a - 3b - 2a^2 + ab = -2a^2 - 2b^2 + 6a - 3b$

4.33

Het gaat hier om een gemeenschappelijke factor (vermenigvuldigingsgetal) die in meerdere termen (cijfers en letters tussen een + of - teken) voorkomen. Deze factor haal je 'buiten haakjes'.

- a. $6 * a + 6 * 2 = 6(a + 2)$ Hier is 6 de grootste gemeenschappelijke factor van de twee termen.
- b. $4 * 3 * a + 4 * 4 = 4(3a + 4)$
- c. $3 * 3 * a - 3 * 4 = 3(3a - 4)$
- d. $5 * 3 * a - 5 * 2 = 5(3a - 2)$
- e. $9 * 3 * a + 9 * 9 = 9(3a + 9) = 9(3 * a + 3 * 3) = 27(a + 3)$

Hier lijkt, wellicht, in eerste instantie 9 het grootste getal te zijn dat je door beide termen kunt delen. Toch valt dit nog verder te vereenvoudigen...

4.34

- a. $3 * a - 3 * 2 * b + 3 * 3 = 3(a - 2b + 3)$
- b. $4 * 3 * a + 4 * 2 * b - 4 * 4 = 4(3a + 2b - 4)$
- c. $3 * 3 * a + 4 * 3 * b + 3 * 1 = 3(3a + 4b + 1)$
- d. $6 * 5 * a - 6 * 4 * b + 6 * 10 = 6(5a - 4b + 10)$
- e. $6 * 4 * a + 6 * 10 * b - 6 * 6 = 6(4a + 10b - 6) = 12(2a + 5b - 3)$

4.35

- a. $-3 * 2 * a + 3 * 3 * b - 3 * 5 = -3(2a - 3b + 5)$
- b. $-7 * 2 * a + 7 * 5 * b - 7 * 3 = -7(2a - 5b + 3)$
- c. $-6 * 3 * a - 6 * 4 * b - 6 * 2 * c = -6(3a + 4b + 2c)$
- d. $-7 * 4 * a - 7 * 10 * b + 7 * 6 * c = -7(4a + 10b - 6c) = -7(2 * 2 * a + 2 * 5 * b - 2 * 3 * c) = -7 * 2(2a + 5b - 3c) = -14(2a + 5b - 3c)$
- e. $-9 * 5 * a + 9 * 3 * b - 9 * 7 * c - 9 * 2 = -9(5a - 3b + 7c + 2)$

4.36

- a. $a * a + a * 1 = a(a + 1)$
- b. $a * a * a - a * a = a^2(a - 1)$
- c. $a * a * a - a * a + a = a(a^2 - a + 1)$
- d. $a * a * a * a + a * a * a - a * a = a^2(a^2 + a - 1)$
- e. $a * a * a * a * a * a - a * a * a * a + a * a * a = a^3 * a^3 - a^3 * a + a^3 = a^3(a^3 - a + 1)$

4.37

- a. $3 * a * a + 6 * a = 3 * a * a + 3 * 2 * a = 3a(a + 2)$
- b. $3 * 3 * a * a * a + 3 * 2 * a * a - 3 * a = 3a(3a^2 + 2a - 1)$
- c. $5 * 3 * a * a * a * a - 5 * 2 * a * a * a + 5 * 5 * a * a = 5a^2(3a^2 - 2a + 5)$
- d. $9 * 3 * a^4 * a^2 - 9 * 2 * a^2 * a^2 - 9 * 4 * a^2 = 9a^2(3a^4 - 2a^2 - 4)$
- e. $6 * 8 * a * a * a * a - 6 * 4 * a * a * a + 6 * 6 * a * a + 6 * 10 * a = 6a(8a^3 - 4a^2 + 6a^1 + 10) = 12a(4a^3 - 2a^2 + 3a + 5)$

4.38

- a. $3 * a * a * b + 3 * 2 * a * b = 3ab(a + 2)$
- b. $3 * 3 * a * a * b - 3 * 3 * a * b * b = 3 * 3 * a * b(a - b) = 9ab(a - b)$
- c. $3 * 4 * a * b * b - 4 * a * b = 4 * a * b(3 * b - 1) = 4ab(3b - 1)$
- d. $7 * 2 * a * a * b * b - 7 * 3 * a * b * b = 7 * a * b * b(2 * a - 3) = 7ab^2(2a - 3)$
- e. $3 * 6 * a * a * b * b - 3 * 5 * a * a * b = 3 * a * a * b(6 * b - 5) = 3a^2b(6b - 5)$

4.39

- a. $3 * a * a * a * b * b + 3 * 2 * a * a * b = 3 * a * a * b(a * b + 2) = 3a^2b(ab + 2)$
- b. $3 * 2 * a * a * a * a * b * b * b - 3 * 3 * a * a * a * b * b + 3 * 4 * a * a * b = 3 * a * a * b(3 * a * a * b * b - 3 * a * b + 4) = 3a^2b(3a^2b^2 - 3ab + 4)$
- c. $5 * 2 * a * a * a * b * b * c * c - 5 * a * a * b * c * c - 5 * 3 * a * b * c = 5abc(2a^2bc - ac - 3)$
- d. $4 * 2 * a^3 * a^3 * b^4 * b^1 * c^3 * c^1 - 4 * 3 * a^3 * a^1 * b^4 * c^3 + 4 * 5 * a^3 * b^4 * c^3 = 4 * a^3 * b^4 * c^3(2 * a^3 * b^1 * c^1 - 3 * a^1 + 5) = 4a^3b^4c^3(2a^3bc - 3a + 5)$
- e. $a^3 * b^3 * c * c^2 + a^3 * b^3 * c * c + a^3 * b^3 * c = a^3b^3c(c^2 + c + 1)$

NB: *het ontdekken van wat je buiten de haakjes kan halen heb ik bij 4.39d. zo gedaan dat ik meteen alle termen uitgeschreven heb in de laagst voorkomende machten. Dit was hier met 'a' bijv. de derde macht: a^3. Dit is de macht van a die in alle termen het laagst is en kan dus buiten haakjes worden gehaald. Vandaar dat ik het hier ook niet volledig uitgeschreven heb.*

4.40

- a. $-2 * 2 * a^2 * b * b^2 * c^2 + 2 * a^2 * b * b * c^2 - 2 * 3 * a^2 * b * c^2 = -2a^2bc^2(2b^2 - b + 3)$
- b. $a^3 * a^3 * b^5 * c^3 * c - a^3 * a * b^5 * b * c^3 * c - a^3 * b^5 * b^2 * c^3 = a^3 * b^5 * c^3(a^3 * c - a * b * c - b^2) = a^3b^5c^3(a^3c - abc - b^2)$
- c. $-2 * a^2 * a * c^2 * c^2 + 2 * a^2 * b^2 * c^2 * c - 2 * 2 * a^2 * b * c^2 = -2a^2c^2(ac^2 - b^2c + 2b)$
- d. $-a^5 * a^2 * b^6 + a^5 * a * b^6 * b - a^5 * b^6 = -a^5 * b^6(a^2 - a * b + 1) = -a^5b^6(a^2 - ab + 1)$
- e. $-a^6 * a^2 * b^6 * b * c^6 - a^6 * a * b^6 * c^6 * c + a^6 * b^6 * c^6 = -a^6 * b^6 * c^6(a^2 * b + a * c - 1) = -a^6b^6c^6(a^2b + ac - 1)$

4.41

- a. $(b + 3)(a + 3) = (a + 3)(b + 3)$
- b. $(b - 1)(a - 2)$
- c. $(b + 4)(2a + 7)$
- d. $(2b - 1)(a^2 + 2)$
- e. $(b - 2)(a - 1)$

Het deel tussen de tweede set haakjes heeft een gemeenschappelijke factor: 'a'.

4.42

- a. $(b + 1)(a^2 - a) = (b + 1)(a * a - a) = (b + 1)(a)(a - 1) = a(b + 1)(a - 1)$
- b. $(2b + 1)(6a + 12) = (2b + 1)(2 * 3 * a + 2 * 2 * 3) = (2b + 1)(6)(a + 2) = 6(2b + 1)(a + 2)$
- c. $(b - 1)(-2a + 4) = (b - 1)(-2)(a - 2) = -2(b - 1)(a - 2)$
- d. $(4b + 3)(a^3 - a^2) = (4b + 3)(a^{3-2}) = (4b + 3)a \dots \text{of} \dots = a^2(a - 1)(4b + 3)$
- e. $(2b + 3)(-6a^2 - 9a) = (2b + 3)(-3 * 2 * a^2 - 3 * 3 * a) = (2b + 3)(-3a)(2a + 3) = (-6ab - 9a)(2a + 3) = -3a(2b + 3)(2a + 3)$

Het boek wil nog wel eens de factoren tussen haakjes omdraaien (of ik..). Maar dit blijft hetzelfde.

4.43

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

4.44

- $2((a + 3)(a + 3)) + 4(a + 3) = (a + 3)(2(a + 3) + 4) = (a + 3) * 2 * ((a + 3) + 2) = 2(a + 3)(a + 5)$
- $(a + 3)$ en $(b + 1)$ zijn beide gemeenschappelijke factoren van de twee termen.
 $((a + 3)(b + 1)) * ((a + 3) - 2) = (a + 3)(b + 1)(a + 1)$
- $(a - 1)$ en $(a + 2)$ zijn beide gemeenschappelijke factoren.
 $(a - 1)(a + 2) * ((a - 1) - (a + 2)) = (a - 1)(a + 2)(-3)$
- $3(a + 2)(a + 2)(a - 2) + 9(a + 2)(a - 2)(a - 2) = (a + 2)(a - 2) * (3(a + 2) + 9(a - 2)) = 3(a + 2)(a - 2)((a + 2) + 3(a - 2)) = 3(a - 2)(a + 2) * (a + 2 + 3a - 6) = 3(a - 2)(a + 2) * (4a - 4) = 3(a - 2)(a + 2) * 4(a - 1) = 12(a - 2)(a + 2)(a - 1)$
- $$\underbrace{-2(a + 4)(a + 4)(a + 4)}_{\text{Term 1}} + \underbrace{6(a + 4)(a + 4)(a + 2)}_{\text{Term 2}} = ..$$

$-2(a + 4)(a + 4)$ is de gemeenschappelijke factor van de twee termen.

$$\begin{aligned} -2(a + 4)(a + 4) * ((a + 4) - 3(a + 2)) &= -2(a + 4)^2 * (a + 4 - 3a - 6) = \\ -2(a + 4)^2 * (-2a - 2) &= -2(a + 4)^2 * -2(a + 1) = -2 * -2 * (a + 4)^2 * (a + 1) = \\ 4(a + 4)^2(a + 1) \end{aligned}$$

4.45

- $a * a + a * 1 + 3 * a + 3 * 1 = a^2 + a + 3a + 3 = a^2 + 4a + 3$
- $2a * a + 2a * 3 + 3 * a + 3 * 3 = 2a^2 + 6a + 3a + 9 = 2a^2 + 9a + 9$
- $a * 3a + a * 1 - 6 * 3a - 6 * 1 = 3a^2 + a - 18a - 6 = 3a^2 - 17a - 6$
- $4a * 5a + 4a * 4 - 5 * 5a - 5 * 4 = 20a^2 + 16a - 25a - 20 = 20a^2 - 9a - 20$
- $3a * 2a + 3a * (-5) + 9 * 2a + 9 * (-5) = 6a^2 + (-15)a + 18a + (-45) = 6a^2 + 3a - 45$
- $6a * 4a + 6a * 10 - 12 * 4a - 12 * 10 = 24a^2 + 60a - 48a - 120 = 24a^2 + 12a - 120$

4.46

- $(-3)a * 8a - 3a * (-3) + 8 * 8a + 8 * (-3) = -24a^2 + 9a + 64a - 24 = -24a^2 + 73a - 24$
- $7a * 8a + 7a * (-11) + 12 * 8a + 12 * (-11) = 56a^2 - 77a + 96a - 132 = 56a^2 + 19a - 132$
- $17a * a + 17a * (-17) + 1 * a + 1 * (-17) = 17a^2 - 289a + a - 17 = 17a^2 - 288a - 17$
- $(-2)a * (-3)a - 2a * (-6) + 6 * (-3)a + 6 * (-6) = 6a^2 + 12a - 18a - 36 = 6a^2 - 6a - 36$
- $a * b + a * (-5) + 3 * b + 3 * (-5) = ab - 5a + 3b - 15$
- $2a * 3b + 2a * 5 + 8 * 3b + 8 * 5 = 6ab + 10a + 24b + 40$

4.47

- $(-4)a * b - 1 * (-4)a + 1 * b + 1 * (-1) = -4ab + 4a + b - 1$
- $3a * (-b) + 3a * 3 - 1 * (-b) - 1 * 3 = -3ab + 9a + b - 3$
- $13a * 12b + 13a * 13 + 12 * 12b + 12 * (-13) = 156ab + 169a + 144b - 156$
- $a^2 * a + a^2 * (-4) + 4 * a + 4 * (-4) = a^3 - 4a^2 + 4a - 16$
- $a * a^2 + a * 7 - 1 * a^2 - 1 * 7 = a^3 + 7a - a^2 - 7$
- $a^2 * a^2 + a^2 * 9 + 3 * a^2 + 3 * 9 = a^4 + 9a^2 + 3a^2 + 27 = a^4 + 12a^2 + 27$

4.48

- $2a^2 * a + 2a^2 * 7 - 7 * a - 7 * 7 = 2a^3 + 14a^2 - 7a - 49$
- $(-3)a^2 * (-2)a^2 - 3a^2 * 3 + 2 * (-2)a^2 + 2 * 3 = (-3) * (-2) * a^{2+2} - 3 * 3 * a^2 + (-2) * 2 * a^2 + 2 * 3 = 6a^4 - 9a^2 - 4a^2 + 6 = 6a^4 - 13a^2 + 6$
- $a^2 * 2a^2 + a^2 * (-a) + 2a * 2a^2 + 2a * (-a) = 2a^4 - a^3 + 4a^3 - 2a^2 = 2a^4 + 3a^3 - 2a^2$
- $3a^2 * (-2)a^2 + 3a^2 * 5a - 4a * (-2)a^2 - 4a * 5a = -6a^4 + 15a^3 + 8a^3 - 20a^2 = -6a^4 + 23a^3 - 20a^2$
- $(-6)a^2 * a^2 - 6a^2 * a + 5 * a^2 + 5 * a = (-6)a^4 - 6a^3 + 5a^2 + 5a$
- $9a^2 * 2a^2 + 9a^2 * (-7)a + 7a * 2a^2 + 7a * (-7)a = 18a^4 - 63a^3 + 14a^3 - 49a^2 = 18a^4 - 49a^3 - 49a^2$

4.49

- $(-8)a^2 * 3a^2 - 8a^2 * (-8)a - 3a * 3a^2 - 3a * (-8)a = -24a^4 + 64a^3 - 9a^3 + 24a^2 = -24a^4 + 55a^3 + 24a^2$
- $2a^3 * (-5)a^2 + 2a^3 * 4 - a * (-5)a^2 - a * 4 = -10a^5 + 8a^3 + 5a^3 - 4a = -10a^5 + 13a^3 - 4a$
- $(-1)a^3 * a^2 - a^3 * a + a^2 * a^2 + a^2 * a = -a^5 - a^4 + a^4 + a^3 = -a^5 + a^3$
- $9a^4 * 6a^3 + 9a^4 * 2a^2 - 5a^2 * 6a^3 - 5a^2 * 2a^2 = 54a^7 + 18a^6 - 30a^5 - 10a^4$
- $7a^3 * 8a^3 + 7a^3 * (-5)a - 1 * 8a^3 - 1 * (-5)a = 56a^6 - 35a^4 - 8a^3 + 5a$
- $(-6)a^5 * (-4)a^3 - 6a^5 * (-3)a^2 - 5a^4 * (-4)a^3 - 5a^4 * (-3)a^2 = 24a^8 + 18a^7 + 20a^7 + 15a^6 = 24a^8 + 38a^7 + 15a^6$

4.50

- $2ab * 3ab + 2ab * (-b) + a * 3ab + a * (-b) = 6a^2b^2 - 2ab^2 + 3a^2b - ab$
- $3a^2b * 2ab^2 + 3a^2b * (-3)ab + ab * 2ab^2 + ab * (-3)ab = 6a^3b^3 - 9a^3b^2 + 2a^2b^3 - 3a^2b^2$
- $(-2)a^2b^2 * 2ab^2 - 2a^2b^2 * (-2)ab + 3a^2b * 2ab^2 + 3a^2b * (-2)ab = -4a^3b^4 + 4a^3b^3 + 6a^3b^3 - 6a^3b^2 = -4a^3b^4 + 10a^3b^3 - 6a^3b^2$
- $8a^3b^2 * (-4)a^2b^3 + 8a^3b^2 * (-2)ab^2 - 6ab^3 * (-4)a^2b^3 - 6ab^3 * (-2)ab^2 = -32a^5b^5 - 16a^4b^4 + 24a^3b^6 + 12a^2b^5$
- $-a^5b^3 * a^3b^5 - a^5b^3 * (-1)ab^7 + a^3b^5 * a^3b^5 + a^3b^5 * (-1)ab^7 = -a^8b^8 + a^6b^{10} + a^6b^{10} - a^4b^{12} = -a^8b^8 + 2a^6b^{10} - a^4b^{12}$
- $2a * a^2 + 2a * 2a + 2a * (-2) + 3 * a^2 + 3 * 2a + 3 * (-2) = 2a^3 + 4a^2 - 4a + 3a^2 + 6a - 6 = 2a^3 + 7a^2 + 2a - 6$

4.51

- a. $(-3)a * 4a^2 - 3a * (-a) - 3a * 1 + 2 * 4a^2 + 2 * (-a) + 2 * 1 = -12a^3 + 3a^2 - 3a + 8a^2 - 2a + 2 = -12a^3 + 11a^2 - 5a + 2$
- b. $2a * a + 2a * b + 2a * 4 + b * a + b * b + b * 4 = 2a^2 + 2ab + 8a + ab + b^2 + 4b = 2a^2 + 3ab + 8a + b^2 + 4b$
- c. $(-3)a * 3a - 3a * (-3)b - 3a * (-3) + 3b * 3a + 3b * (-3)b + 3b * (-3) = -9a^2 + 9ab + 9a + 9ab - 9b^2 - 9b = -9a^2 + 18ab + 9a - 9b^2 - 9b$
- d. $9a * 2a + 9a * (-9)b + 9a * 1 + 2 * 2a + 2 * (-9)b + 2 * 1 = 18a^2 - 81ab + 9a + 4a - 18b + 2 = 18a^2 - 81ab + 13a - 18b + 2$
- e. $a^2 * a^2 + a^2 * (-a) + a^2 * 1 + a * a^2 + a * (-a) + a * 1 = a^4 - a^3 + a^2 + a^3 - a^2 + a = a^4 + a$
- f. $2a^2 * 3a + 2a * 3a + 3a * (-1) + 2 * 2a^2 + 2 * 2a + 2 * (-1) = 6a^3 + 6a^2 - 3a + 4a^2 + 4a - 2 = 6a^3 + 10a^2 + a - 2$

4.52

- a. $(-2)a * -a^2 - 2a * (-3)a - 2a * (-4) - 1 * -a^2 - 1 * (-3)a - 1 * (-4) = 2a^3 + 6a^2 + 8a + a^2 + 3a + 4 = 2a^3 + 7a^2 + 11a + 4$
- b. $a * a + a * (-b) + a * (-1) + b * a + b * (-b) + b * (-1) = a^2 - ab - a + ab - b^2 - b = a^2 - a - b^2 - b$
- c. $a^2 * a^2 + a^2 * ab + a^2 * b^2 - b^2 * a^2 - b^2 * ab - b^2 * b^2 = a^4 + a^3b + a^2b^2 - b^2a^2 - ab^3 - b^4 = a^4 - b^4 + a^3b - ab^3$
- d. $(a * a + a * 2 + 1 * a + 1 * 2)(a + 3) = (a^2 + 2a + a + 2)(a + 3) = (a^2 + 3a + 2)(a + 3) = a^2 * a + 3a * a + 2 * a + a^2 * 3 + 3a * 3 + 2 * 3 = a^3 + 3a^2 + 2a + 3a^2 + 9a + 6 = a^3 + 6a^2 + 11a + 6$
- e. $(a * a + a * 2 - 1 * a - 1 * 2)(a - 3) = (a^2 + 2a - a - 2)(a - 3) = (a^2 + a - 2)(a - 3) = a^2 * a + a^2 * (-3) + a * a + a * (-3) - 2 * a - 2 * (-3) = a^3 - 3a^2 + a^2 - 3a - 2a + 6 = a^3 - 2a^2 - 5a + 6$
- f. $(2a * a + 2a * (-1) + 1 * a + 1 * (-1))(2a + 3) = (2a^2 - 2a + a - 1)(2a + 3) = (2a^2 - a - 1)(2a + 3) = 2a^2 * 2a + 2a^2 * 3 - a * 2a - a * 3 - 1 * 2a - 1 * 3 = 4a^3 + 4a^2 - 5a - 3$

4.53

- a. $(2a * a + 2a * (-b) + b * a + b * -b)(2a - b) = (2a^2 - 2ab + ab - b^2)(2a - b) = (2a^2 - ab - b^2)(2a - b) = 2a^2 * 2a + 2a^2 * -b - ab * 2a - ab * -b - b^2 * 2a - b^2 * -b = 4a^3 - 2a^2b - 2a^2b + ab^2 - 2ab^2 + b^3 = 4a^3 - 4a^2b - ab^2 + b^3$
- b. $(5a * 4a + 5a * (-3)b - 4b * 4a - 4b * (-3)b)(3a - 2b) = (20a^2 - 15ab - 16ab + 12b^2)(3a - 2b) = (20a^2 - 31ab + 12b^2)(3a - 2b) = 20a^2 * 3a - 31ab * 3a + 12b^2 * 3a + 20a^2 * (-2)b - 31ab * (-2)b + 12b^2 * (-2)b = 60a^3 - 93a^2b + 36ab^2 - 40a^2b + 62ab^2 - 24b^3 = 60a^3 - 133a^2b + 98ab^2 - 24b^3$
- c. $((-3)a * a^2 - 3a * 3)(a - 2) = (-3a^3 - 9a)(a - 2) = -3a^3 * a - 3a^3 * (-2) - 9a * a - 9a * (-2) = -3a^4 + 6a^3 - 9a^2 + 18a$
- d. $(-3a * a - 3a * 3 + 1 * a + 1 * 3)(-a + 1) = (-3a^2 - 9a + a + 3)(-a + 1) = (-3a^2 - 8a + 3)(-a + 1) = -3a^2 * (-a) - 3a^2 * 1 - 8a * (-a) - 8a * 1 + 3 * (-a) + 3 * 1 = 3a^3 - 3a^2 + 8a^2 - 8a - 3a + 3 = 3a^3 + 5a^2 - 11a + 3$
- e. $(2a^2 * a^2 + 2a^2 * (-1))(a^2 + 2) = (2a^4 - 2a^2)(a^2 + 2) = 2a^6 + 4a^4 - 2a^4 - 4a^2 = 2a^6 + 2a^4 - 4a^2$
- f. $(a^2b * ab^2 + a^2b * ab - ab * ab^2 - ab * ab)(a + b) = (a^3b^3 + a^3b^2 - a^2b^3 - a^2b^2)(a + b) = a^3b^3 * a + a^3b^2 * a - a^2b^3 * a - a^2b^2 * a + a^3b^3 * b + a^3b^2 * b - a^2b^3 * b - a^2b^2 * b = a^4b^3 + a^4b^2 - a^3b^3 - a^3b^2 + a^3b^4 + a^3b^3 - a^2b^4 - a^2b^3 = a^4b^3 + a^4b^2 - a^3b^2 + a^3b^4 - a^2b^4 - a^2b^3$

4.54

- a. $(3a^2b * a^2 + 3a^2b * -b^2)(2a + 2b) = (3a^4b - 3a^2b^3)(2a + 2b) = 2a * 3a^4b + 2a * -3a^2b^3 + 2b * 3a^4b + 2b * -3a^2b^3 = 6a^5b - 6a^3b^3 + 6a^4b^2 - 6a^2b^4$
- b. $a * a^3 + a * a^2 + a * (-a) + a * 2 + 1 * a^3 + 1 * a^2 + 1 * (-a) + 1 * 2 = a^4 + a^3 - a^2 + 2a + a^3 + a^2 - a + 2 = a^4 + 2a^3 + a + 2$
- c. $a^2 * a^2 + a^2 * (-a) + a^2 * 2 + 2a * a^2 + 2a * (-a) + 2a * 2 + 1 * a^2 + 1 * (-a) + 1 * 2 = a^4 - a^3 + 2a^2 + 2a^3 - 2a^2 + 4a + a^2 - a + 2 = a^4 + a^3 + a^2 + 3a + 2$
- d. $-2a^2 * 3a^2 - 2a^2 * -2a - 2a^2 * -1 + 3a * 3a^2 + 3a * -2a + 3a * -1 + 1 * 3a^2 + 1 * -2a + 1 * -1 = -6a^4 + 4a^3 + 2a^2 + 9a^3 - 6a^2 - 3a + 3a^2 - 2a - 1 = -6a^4 + 13a^3 - a^2 - 5a - 1$
- e. $(3a * a^2 + 3a * 1)(a^2 - 2a + 4) = (3a^3 + 3a)(a^2 - 2a + 4) = 3a^3 * a^2 + 3a^3 * -2a + 3a^3 * 4 + 3a * a^2 + 3a * -2a + 3a * 4 = 3a^5 - 6a^4 + 12a^3 + 3a^3 - 6a^2 + 12a = 3a^5 - 6a^4 + 15a^3 - 6a^2 + 12a$
- f. $2a * 5a + 2a * -2b + 2a * 2 + b * 5a + b * -2b + b * 2 - 5 * 5a - 5 * -2b - 5 * 2 = 10a^2 - 4ab + 4a + 5ab - 2b^2 + 2b - 25a + 10b - 10 = 10a^2 + ab - 21a - 2b^2 + 12b - 10$