① a)
$$1 + 1 = 2$$
$$1 + 2 = 3$$
$$2 + 3 = 5$$
$$3 + 5 = 8$$
$$5 + 8 = 13$$
$$8 + 13 = 21$$
$$13 + 21 = 34$$
$$21 + 34 = 55$$
$$34 + 55 = 89$$
$$55 + 89 = 144$$
$$89 + 144 = 233$$
$$144 + 233 = 377$$

b)
$$3:2 = 1,5$$
$$5:3 = 1,667$$
$$8:5 = 1,6$$
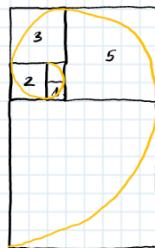$$13:8 = 1,625$$
$$21:13 = 1,615$$
$$34:21 = 1,619$$
$$55:34 = 1,618$$
$$89:55 = 1,618$$

c) Sie nähern sich dem goldenen Schnitt an und liegen abwechselnd darunter und darüber.

a) $\varphi = \dfrac{1 + \sqrt{5}}{2}$

e)

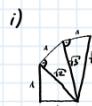f) Architektur, Design, Layout, Fotografie, Kunst, Natur

g) $360° : 1,618 = 222,5°$ $360° - 222,5° = 137,5°$

h)

$$a^2 + b^2 = c^2$$
$$1^2 + 2^2 = c^2$$
$$5 = c^2$$
$$c = \sqrt{5}$$

$x_1 = \sqrt{5} - 1 \approx 1,236$

$x_2 = 2 - 1,236 = 0,764$

$\dfrac{x_1}{x_2} = \dfrac{1,236}{0,764} = 1,618$

i)

$$1^2 + 1^2 = x_1^2$$
$$2 = x_1^2$$
$$x_1 = \sqrt{2}$$

$$1^2 + \sqrt{2}^2 = x_2^2$$
$$3 = x_2^2$$
$$x_2 = \sqrt{3}$$

$$1^2 + \sqrt{3}^2 = x_3^2$$
$$4 = x_3^2$$
$$x_3 = \sqrt{4}$$

② a)
$$(a+b)^2 = a^2 + 2ab + b^2$$
$$(a-b)^2 = a^2 - 2ab + b^2$$
$$(a+b)(a-b) = a^2 - b^2$$

b) $(3x-4)^2 = 9x^2 - 24x + 16$

c) $(2a-3)(3+2a) = (2a-3)(2a+3) = 4a^2 - 9$

d) $(b^3 - 4x^2)^2 = b^6 - 8b^3x^2 + 16x^4$

e) $a^2 + 4ab + 4b^2 = (a+2b)^2$

f) $9a^2 - 42ab + 49b^2 = (3a - 7b)^2$

g) $x^2 + 8xy^3 + 16y^6 = (x + 4y^3)^2$

h) $25x^2 - 16y = (5x + 4\sqrt{y})(5x - 4\sqrt{y})$

③ a) $(7+2x)^4 = 1 \cdot 7^4 (2x)^0 + 4 \cdot 7^3 (2x)^1 + 6 \cdot 7^2 (2x)^2 + 4 \cdot 7^1 (2x)^3 + 1 \cdot 7^0 (2x)^4$
$$= 2401 + 2744x + 1176x^2 + 224x^3 + 16x^4$$

```
        1
       1 1
      1 2 1
     1 3 3 1
    1 4 6 4 1
   1 5 10 10 5 1
```

b) $(5-x)^5 = 1 \cdot 5^5 (-x)^0 + 5 \cdot 5^4 (-x)^1 + 10 \cdot 5^3 (-x)^2 + 10 \cdot 5^2 (-x)^3 + 5 \cdot 5^1 (-x)^4 + 1 \cdot 5^0 (-x)^5$
$$= 3125 - 3125x + 1250x^2 - 250x^3 + 25x^4 - x^5$$