2.8

a) $4x - 5 < 3$

$4x < 3 + 5$

$4x < 8 \quad |:4$

$x < 2$

$2 < 3 \quad |+5$

$7 < 8 \quad |\cdot 2$

$14 < 16 \quad |\cdot(-1)$

$-14 > -16$ ↑ kääntyy, jos kerrotaan negatiivisella luvulla

b) $2x - 3 \geq 4 - 3x$

$2x + 3x \geq 4 + 3$

$5x \geq 7 \quad |:5$

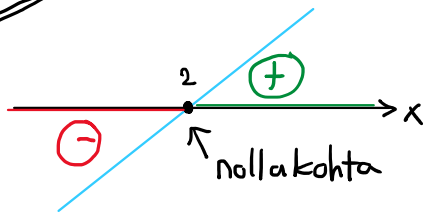
$x \geq \frac{7}{5}$

---

esim. Milloin $f(x) = 3x - 6$ on positiivinen? (>0) negatiivinen? (<0)

↑ $k > 0$, kuvaaja on kasvava suora

KERTAUS



$f(x) = 0$

$3x - 6 = 0$

$3x = 6 \quad |:3$

$x = 2$

$f(x) > 0$, kun $x > 2$

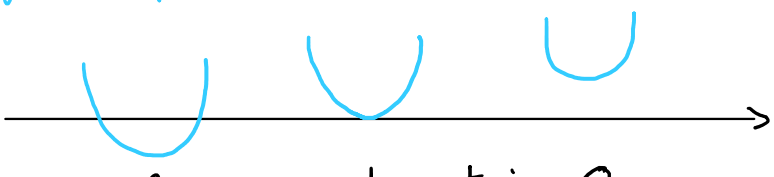
$f(x) < 0$, kun $x < 2$

---

2. asteen polynomifunktio

$f(x) = ax^2 + bx + c$

kuvaaja on paraabeli



nollakohtia 2, 1 tai 0.

2. asteen yhtälö voidaan ratkaista

2. asteen yhtälö voidaan ratkaista kaavalla: $ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

3.1

$f(x) = 0$

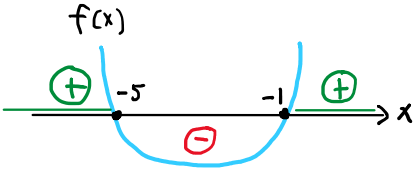
a) $x^2 + 6x + 5 = 0$

$a = 1 \quad b = 6 \quad c = 5$

$$x = \frac{-6 \pm \sqrt{6^2 - 4 \cdot 1 \cdot 5}}{2 \cdot 1} = \frac{-6 \pm \sqrt{36 - 20}}{2} = \frac{-6 \pm \sqrt{16}}{2}$$

$$= \frac{-6 \pm 4}{2} \qquad x = \frac{-6+4}{2} = \frac{-2}{2} = -1$$

tai $x = \frac{-6-4}{2} = \frac{-10}{2} = -5$



$f(x) > 0$ kun $x > -1$ tai $x < -5$

$f(x) < 0$ kun $-5 < x < -1$

$f(x) = y$

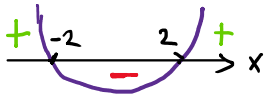
b) $2x^2 - 3 = 5$

$2x^2 - 3 - 5 = 0$

$2x^2 - 8 = 0$

$f(x) = 2x^2 - 8$

$a = 2 \quad b = 0 \quad c = -8$



$$x = \frac{-0 \pm \sqrt{0^2 - 4 \cdot 2 \cdot (-8)}}{2 \cdot 2} = \frac{\pm\sqrt{64}}{4} = \frac{\pm 8}{4} = \pm 2$$

($x = 2$ tai $x = -2$)

$ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$f(x) = 0$, kun $x = \pm 2$

$f(-2) = 0$

$f(2) = 0$

TAI

$2x^2 - 8 = 0$

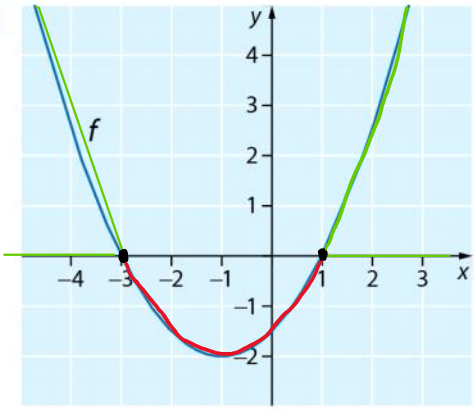
$2x^2 = 8 \quad || : 2$

$x^2 = 4$

$x = \pm\sqrt{4} \Leftrightarrow x = \pm 2$

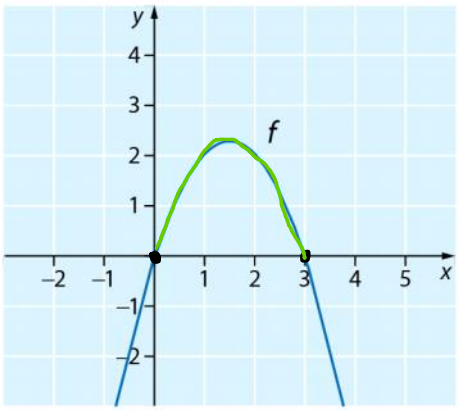
3.4 Millä muuttujan x arvoilla funktion f arvot ovat positiivisia?

a)



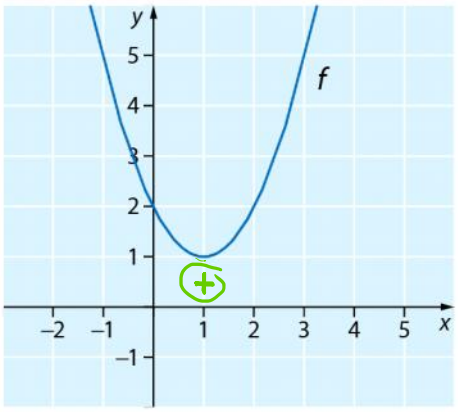
$f(x) > 0$
kun $x > 1$ tai $x < -3$

b)



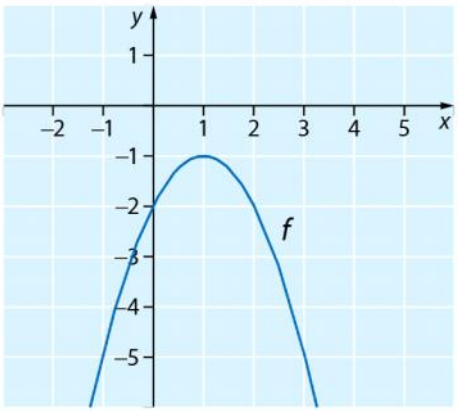
$f(x) > 0$
kun $0 < x < 3$

c)



$f(x) > 0$
kaikilla muuttujan x arvoilla

d)



$f(x) > 0$
ei millään muuttujan x arvolla

3.8 Tutki funktion merkkiä.

a) $f(x) = -x^2 + 16$

b) $g(x) = x^2 + 3x$

a) $f(x) = 0$

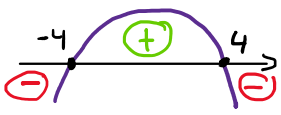
$-x^2 + 16 = 0$

$-x^2 = -16 \quad /:(-1)$

$x^2 = 16$

$x = \pm\sqrt{16}$

$x = \pm 4$



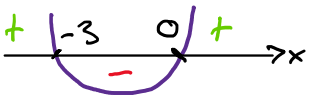
b) $g(x) = 0$

$x^2 + 3x = 0$

$x(x+3) = 0$ tulon nollasääntö

$x = 0$ tai $x + 3 = 0$

$x = -3$



3.6 3.7