

2. Polynomifunktio

2.9 $ax^2 - 5x + 2 = 0$

1° $a = 0$: $-5x + 2 = 0 \Leftrightarrow 2 = 5x \quad | :5 \Leftrightarrow x = \frac{2}{5}$ (1 juuri)

2° $a \neq 0$: $D = b^2 - 4ac = (-5)^2 - 4 \cdot a \cdot 2 = 25 - 8a = 0 \Leftrightarrow a = \frac{25}{8}$

1° & 2° $\Rightarrow$ Var. $a = \frac{25}{8}$ tai $a = 0$

2.11 a) $3x^3 - 6x^2 + 3x = 3x(x^2 - 2x + 1) = 3x(x-1)^2$

b) $81x^4 - 16 = (9x^2)^2 - 4^2 = (9x^2 - 4)(9x^2 + 4)$
 $(a^2 - b^2) \quad (a-b) \quad (a+b)$
 $= ((3x)^2 - 2^2)(9x^2 + 4) = (3x-2)(3x+2)(9x^2 + 4)$

c) $x^4 - 2x^3 + 2x^2 - 4x = x(x^3 - 2x^2 + 2x - 4)$
 $= x(x^2(x-2) + 2(x-2))$ (ryhmittely-
 $= x(x-2)(x^2 + 2)$ keino)

2.21 $4x^4 - 2x^3 + 2x^2 - x \geq 0 \rightarrow f: \mathbb{R}$ kääntä x -akselille tai sen yleis-
 Vastaus yllä: $4x^4 - 2x^3 + 2x^2 - x = 0$ lelle

$\Leftrightarrow x(4x^3 - 2x^2 + 2x - 1) = 0$

$\Leftrightarrow x(2x^2(2x-1) + (2x+1)) = 0$

$\Leftrightarrow x(2x-1)(2x^2+1) = 0$

$\Leftrightarrow x=0$ tai $2x-1=0$ tai $2x^2+1=0$ $\downarrow$
 $\Leftrightarrow x = \frac{1}{2}$ ≥ 0

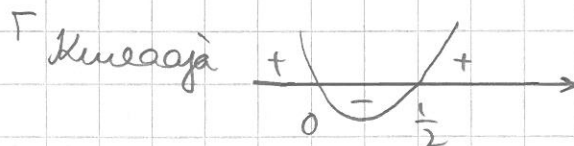
Merkitseminen

+	-	+
0	$\frac{1}{2}$	

$f(-1) = 4 \cdot (-1)^4 - 2 \cdot (-1)^3 + 2 \cdot (-1)^2 - (-1) = 9 > 0$

$f(0,1) = \dots \approx -0,0816 < 0$

$f(1) = 3 > 0$



Var. $x \leq 0$ tai $x \geq \frac{1}{2}$

2.23 $P(x) = x^3 + ax^2 + bx + c = (x^2 - 1)(x + d)$, $P(2) = 12$

$\Rightarrow P(2) = \underbrace{(2^2 - 1)}_{=3} (2 + d) = 12 \quad | :3 \Leftrightarrow 2 + d = 4 \Leftrightarrow d = 2$

$\Rightarrow P(x) = \underline{(x^2 - 1)(x + 2) = x^3 + 2x^2 - x - 2}$