

MaA7 Kertaus

$$\textcircled{1} \quad \frac{x-1}{x^2-1} - \frac{x-1}{x+1} - 2 = \frac{x-1}{x^2-1} - \frac{(x-1)^2}{x^2-1} - \frac{2(x^2-1)}{x^2-1}$$

$$= \frac{x-1 - (x^2-2x+1) - 2(x^2-1)}{x^2-1} = \frac{-3x^2+3x}{x^2-1} = \frac{-3x(x-1)}{(x+1)(x-1)} = \frac{-3x}{x+1}$$

lausekkeen arvo, kun $x = -\frac{13}{17}$

$$\frac{-3x}{x+1} = \frac{-3 \cdot (-\frac{13}{17})}{-\frac{13}{17} + 1} = \frac{3 \cdot \frac{13}{17}}{\frac{4}{17}} = 3 \cdot \frac{13}{17} \cdot \frac{17}{4} = \frac{39}{4} = 9\frac{3}{4}$$

$$\textcircled{2} \quad \frac{x}{x-1} \geq -\frac{1}{x} + \frac{1}{x^2-x}$$

$$\frac{x}{x-1} + \frac{1}{x} - \frac{1}{x^2-x} \geq 0$$

$$\frac{x^2}{x(x-1)} + \frac{x-1}{x(x-1)} - \frac{1}{x(x-1)} \geq 0$$

$$\frac{x^2+x-2}{x(x-1)} \geq 0$$

Osoittajan nollakohdat

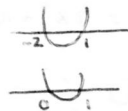
$$x^2+x-2=0$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4 \cdot 1 \cdot (-2)}}{2 \cdot 1} = \frac{-1 \pm 3}{2}$$

$$x = \frac{-1+3}{2} = 1 \text{ TAI } x = \frac{-1-3}{2} = -2$$

Merkkikaavio:

	-2	0	1	
x^2+x-2	+	-	-	+
$x(x-1)$	+	+	-	+
osamäärä	+	-	+	+



Nimittäjän nollakohdat (lauseke ei määritelty)

$$x(x-1)=0$$

$$x=0 \text{ tai } x-1=0$$

$$x=1$$

$$\forall: x \leq -2 \text{ tai } 0 < x < 1 \text{ tai } x > 1$$

$$\textcircled{3} \text{ a) } \lim_{x \rightarrow 1} (1-2x+x^3) = 1-2 \cdot 1 + 1^3 = 0$$

$$\text{b) } \lim_{x \rightarrow -3} \frac{-3-x}{x} = \frac{-3-(-3)}{-3} = \frac{0}{-3} = 0$$

$$\text{c) } \lim_{x \rightarrow 2} \left[\frac{1}{x-2} \cdot \left(\frac{1}{x-1} - 1 \right) \right] = \lim_{x \rightarrow 2} \left[\frac{1}{x-2} \cdot \frac{1-(x-1)}{x-1} \right] = \lim_{x \rightarrow 2} \left[\frac{1}{x-2} \cdot \frac{-x+2}{x-1} \right]$$

$$= \lim_{x \rightarrow 2} \left[\frac{1}{x-2} \cdot \frac{-(x-2)}{x-1} \right] = \lim_{x \rightarrow 2} \left[\frac{-1}{x-1} \right] = \frac{-1}{2-1} = -1$$