

MATY010

Hargi: 1

$$1a) \frac{2^7 \cdot 7^2}{14^3} - \sqrt{\frac{9}{4}}$$

$$= \frac{2^7 \cdot 7^2}{2^3 \cdot 7^3} - \frac{\sqrt{9}}{\sqrt{4}}$$

$$= \frac{2^{4(2)} \cdot 7^{(2)}}{7} - \frac{3}{2}$$

$$= \frac{2^5 - 21}{14}$$

$$= \frac{32 - 21}{14}$$

$$= \frac{11}{14}$$

$$b) -(-3x^2 + 3)$$

$$+ (x^2 + 5x - 1)(-x - 3)$$

$$= 3x^2 - 3 - x(x^2 + 5x - 1) - 3(x^2 + 5x - 1)$$

$$= \cancel{3x^2} - 3 - x^3 - 5x^2 + x - \cancel{3x^2} - 15x + 3$$

$$= -x^3 - 5x^2 + x - 15x$$

$$= -x^3 - 5x^2 - 14x$$

2. x Taksimatkan pitrus (km)  
 f(x) Taksimatkan harga (€)

$$f(x) = 8,60 + x \cdot 1,43$$

$$a) f(5,5) = 16,465 \quad V \approx \underline{16,47€}$$

(= 8,60 + 5,5 \cdot 1,43)

$$b) f(8,7) = 21,041 \quad V \approx 21,04€$$

(= 8,60 + 8,7 \cdot 1,43)

$$3. f(x) = 4x^2 - 5x$$

$$a) f(-3) = 4(-3)^2 - 5(-3) \\ = 4 \cdot 9 + 15 = 36 + 15 = 51$$

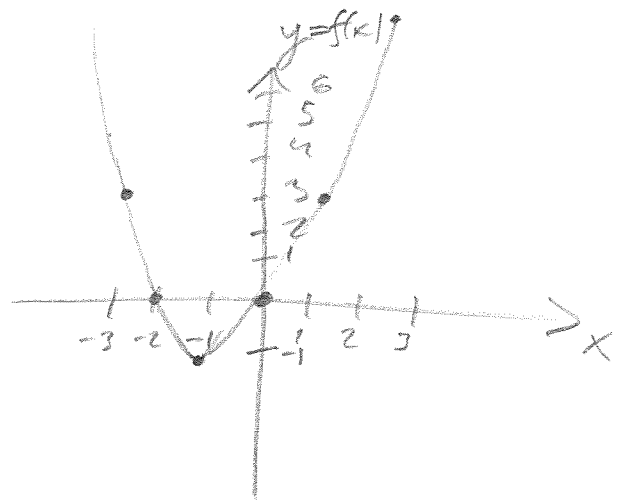
$$b) f(1+a) = 4(1+a)^2 - 5(1+a) \\ = 4(1+2a+a^2) - 5 - 5a \\ = 4 + 8a + 4a^2 - 5 - 5a = 4a^2 + 3a - 1$$

$$c) f(1-a) = 4(1-a)^2 - 5(1-a) \\ = 4(1-2a+a^2) - 5 + 5a \\ = 4 - 8a + 4a^2 - 5 + 5a = 4a^2 - 3a - 1$$

$$d) f(1+a) + f(1-a) = 4a^2 + 3a - 1 + 4a^2 - 3a - 1 \\ = 8a^2 - 2.$$

4

x	f(x) = x <sup>2</sup> + 2x
-3	(-3) <sup>2</sup> + 2(-3) = 9 - 6 = 3
-2	(-2) <sup>2</sup> + 2(-2) = 0
-1	(-1) <sup>2</sup> + 2(-1) = -1
0	0 <sup>2</sup> + 2 \cdot 0 = 0
1	1 <sup>2</sup> + 2 \cdot 1 = 3
2	2 <sup>2</sup> + 2 \cdot 2 = 8



Piirtämisessä oli hyödyksi huomata että funktion  $f$  kuvaaja on ylöspäin aukeava paraabeli, jolla on huippu pisteessä  $(-1, -1)$

$$5) a) \frac{a}{a(a+1)} (a^2-1) + 1$$

$$= \frac{a(a^2-1)}{a(a+1)} + 1 \quad \begin{array}{l} \cancel{a} \\ \cancel{a} \end{array} \quad \begin{array}{l} \cancel{a^2-1} \\ \cancel{a^2-1} \end{array} = (a-1)(a+1)$$

$$= \frac{(a-1)\cancel{a+1}}{\cancel{a+1}} + 1$$

$$= a - 1 + 1 = a$$

$$b) \frac{x^2+6x+9}{x^2-9} \quad \begin{array}{l} \cancel{x+3} \\ \cancel{x+3} \end{array} \quad \begin{array}{l} \cancel{x^2+6x+9} \\ \cancel{x^2+6x+9} \end{array} = (x+3)^2$$

$$\quad \begin{array}{l} \cancel{x+3} \\ \cancel{x+3} \end{array} \quad \begin{array}{l} \cancel{x^2-9} \\ \cancel{x^2-9} \end{array} = (x+3)(x-3)$$

$$= \frac{\cancel{(x+3)}(x+3)}{\cancel{(x+3)}(x-3)} = \frac{x+3}{x-3}$$

$$c) \frac{4x}{x^2-4} : \frac{x}{x+2} = \frac{4x}{\cancel{x+2}(x-2)} \cdot \frac{\cancel{x+2}}{\cancel{x}} = \frac{4}{x-2}$$

$$6) f(x) = |2x-1|$$

$$f(-1) = |2(-1)-1| = |-2-1| = |-3| = 3$$

$$f(1) = |2 \cdot 1 - 1| = |2-1| = |1| = 1$$

$$f\left(\frac{8}{3}\right) = \left|2 \cdot \frac{8}{3} - 1\right| = \left|\frac{16}{3} - \frac{3}{3}\right| = \left|\frac{13}{3}\right| = \frac{13}{3}$$

$$g(x) = \begin{cases} 2-x, & \text{kun } x < 1, \\ x+1, & \text{kun } x \geq 1. \end{cases}$$

$$g(-1) \stackrel{-1 < 1}{=} 2 - (-1) = 2 + 1 = 3$$

$$g(1) \stackrel{1 \geq 1}{=} 1 + 1 = 2$$

$$g\left(\frac{8}{3}\right) \stackrel{\frac{8}{3} \geq 1}{=} \frac{8}{3} + 1 = \frac{8}{3} + \frac{3}{3} = \frac{11}{3}.$$

7. Opiskelijoiden maksettu vuokra:  $x$  (Kaikki yksiköt  
tässä euroja.)  
Vuokra yhtivastikkeeseen jälkeen:  $x - 125$

$$\text{Nettotulo: } f(x) = (1 - 0,28)(x - 125) = 0,72(x - 125) \\ = 0,72x - 90$$

$$f(400) = 0,72 \cdot 400 - 90 \\ = 288 - 90 = 198.$$

Vastaus: Nettovuokratulo on 198 €.