

Plan

- 1 Sammendrag: Kvadratiske funksjoner
- 2 Oppgavesett 10: Oppgave 5,7,8,9

① Sammendrag:Kvadratiske funksjoner:

$$\begin{aligned}
 f(x) &= ax^2 + bx + c \quad (a \neq 0) \\
 &= a(x-r_1)(x-r_2) \\
 &= \underline{a(x-s)^2 + d}
 \end{aligned}$$

- standardform
- røtter (nullpunkt) r_1, r_2
- Symmetrilinje $x=s$ og topp/bunnpunkt (s, d)

Lineære funksjoner:

$$f(x) = ax + b \quad \text{std. form}$$

a : stigningstall
 b : skjærings med y-aksen

② Oppgavesett 10:

5. a) $f(x) = a(x-2)(x-5)$ $\leftarrow (0,5)$
 $5 = a(-2)(-5)$
 $10a = 5 \quad a = \frac{1}{2}$

$$f(x) = \underline{\underline{\frac{1}{2}(x-2)(x-5)}}$$

b) $f(x) = a(x-2)(x+3)$
 $(0,6) \rightarrow 6 = a(-2)(3)$
 $-6a = 6 \quad a = -1$

$$r_1 = \underline{2} \quad r_2 = -\frac{1}{2} - \frac{5}{2} = \underline{-3}$$

$$s = -\frac{1}{2}$$

$$f(x) = \underline{\underline{-(x-2)(x+3)}}$$

c) $f(x) = a \cdot (x-100)^2$
 $(90,10) \rightarrow 10 = a(90-100)^2$
 $10 = 100a \quad a = \frac{10}{100} = \frac{1}{10}$

$$r_1 = r_2 = 100 \quad \text{eller} \quad (s, d) = (100, 0)$$

$$f(x) = \underline{\underline{\frac{1}{10}(x-100)^2}}$$

$$d) f(x) = a(x-1)^2 - 1$$

$$(s,d) = (1, -1)$$

$$f(0, -2) \rightarrow -2 = a \cdot (-1)^2 - 1 = a - 1$$

$$\underline{a = -1}$$

$$\underline{\underline{f(x) = -(x-1)^2 - 1}}$$

$$f) f(x) = a(x-50)^2 + 1$$

$$(s,d) = (50, 1)$$

$$(40, 2) \rightarrow 2 = a(40-50)^2 + 1$$

$$1 = a \cdot 100 \quad a = \frac{1}{100}$$

$$\underline{\underline{f(x) = \frac{1}{100}(x-50)^2 + 1}}$$

7. a) $f(x) = ax^2 + bx + c = ax^2 + bx + 7 = \underline{\underline{x^2 - 4x + 7}}$

$$P = (0, 7): 7 = a \cdot 0^2 + b \cdot 0 + c$$

$$Q = (1, 4): 4 = a \cdot 1^2 + b \cdot 1 + 7$$

$$R = (2, 3): 3 = a \cdot 2^2 + b \cdot 2 + 7$$

$$\underline{c = 7}$$

$$\begin{cases} a + b = -3 \\ 4a + 2b = -4 \end{cases}$$

$$b = -3 - a$$

$$4a + 2(-3 - a) = -4$$

$$2a - 6 = -4$$

$$2a = 2$$

$$\underline{a = 1}$$

$$\underline{b = -4}$$

b) Symmetri-linjer: Midtpunkt mellom

$$x = -5 \text{ og } x = +3 \Rightarrow \underline{\underline{s = -1}}$$

$$f(x) = a(x+1)^2 + d = \underline{\underline{-(x+1)^2 + 81}}$$

$$(-5, 65): 65 = a(-4)^2 + d$$

~~$$(3, 65): 65 = a(4)^2 + d$$~~

$$(7, 17): 17 = a(8)^2 + d$$

$$\begin{cases} 16a + d = 65 \\ 64a + d = 17 \end{cases}$$

$$16 \cdot (-1) + d = 65$$

$$\underline{d = 81}$$

$$\underline{\underline{-48a = 48}} \quad \underline{\underline{a = -1}}$$

$$c) (s, d) = (13/2, -49/4)$$

$$f(x) = a(x - 13/2)^2 - 49/4 = \underline{\underline{(x - 13/2)^2 - 49/4}}$$

$$(4, -6): -6 = a(4 - 13/2)^2 - 49/4$$

$$-6 = a(-5/2)^2 - 49/4 \quad | \cdot 4$$

$$-24 = a \cdot \frac{25}{4} \cdot 4 - \frac{49}{4} \cdot 4 = 25a - 49$$

$$-24 + 49 = 25a \quad 25a = 25 \quad \underline{a=1}$$

$$\underline{8.} \quad a) \quad f(x) = \underline{x^2 - 10x + 30}$$

$$= x^2 - 10x + \left(\frac{-10}{2}\right)^2 + 30 - \left(\frac{-10}{2}\right)^2$$

$$= \underline{\underline{(x-5)^2 + 5}} \quad a=1 \quad s=5 \quad d=5$$

$$b) \quad f(x) = 3x^2 + 36x + 110$$

$$= 3(x^2 + 12x + 6^2) + 110$$

$$= \underline{\underline{3(x+6)^2 + 2}}$$

$$= a(x-s)^2 + d$$

$$a=3 \quad s=-6 \quad d=2$$

$$c) \quad f(x) = \underline{-\frac{1}{7}x^2 + 2x - 6}$$

$$= -\frac{1}{7}(x^2 - 14x + 7^2) - 6 + \frac{1}{7} \cdot 7^2$$

$$= \underline{\underline{-\frac{1}{7}(x-7)^2 + 1}}$$

$$a = -\frac{1}{7} \quad s = 7 \quad d = 1$$

9. a) $I(x) = px$ $p > 0$ pris per enhet
 $K(x) = 2100 + 5x$
 $\pi(x) = I(x) - K(x)$
 $= px - (2100 + 5x)$ ← profit/overskudd
 $= \underline{(p-5)x - 2100}$ ←

Bestem p slik at: $\begin{cases} \pi(x) < 0 & \text{for } x < 300 \\ \pi(x) > 0 & \text{" } x > 300 \end{cases}$

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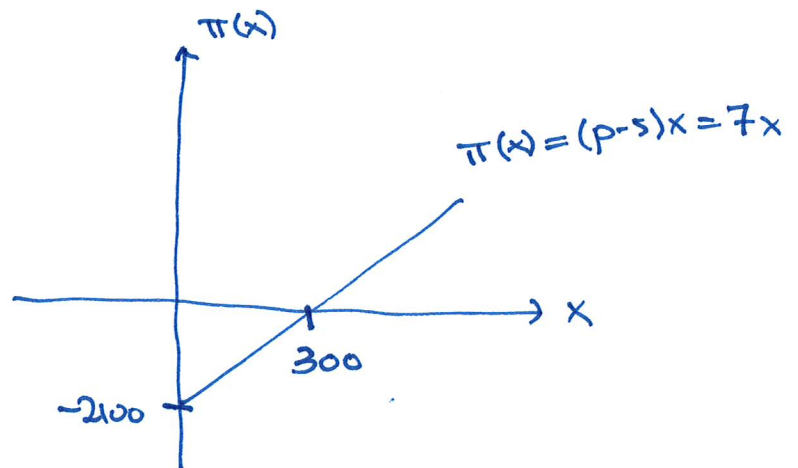
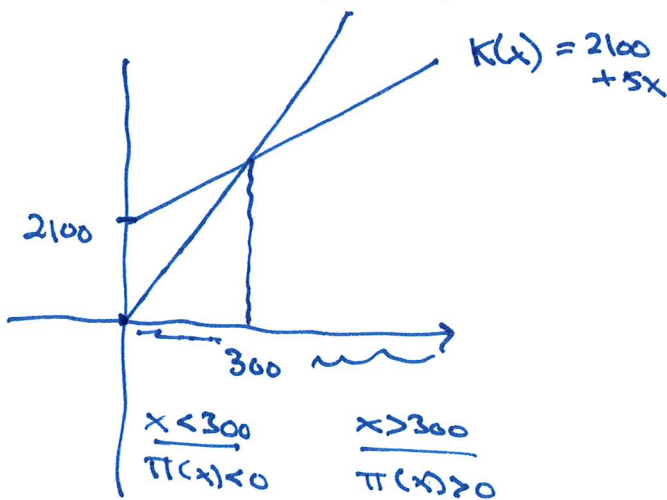
Nærløst
betegnelse:
 $I(x) = px = 12x$

$\pi(300) = 0$
 $(p-5) \cdot 300 - 2100 = 0$

$\frac{(p-5)300}{300} = \frac{2100}{300}$

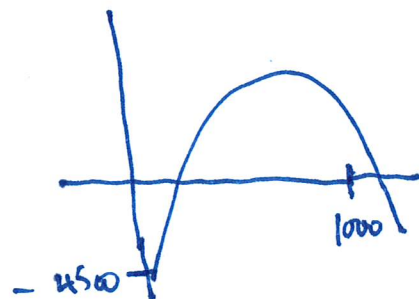
$p-5 = 7$

$p = 12$



$$b) \quad \left. \begin{aligned} I(x) &= px \quad (p > 0) \\ K(x) &= 4500 - 5x + 0.01x^2 \end{aligned} \right\} 0 \leq x \leq 1000$$

$$\begin{aligned} \pi(x) &= px - (4500 - 5x + 0.01x^2) \\ &= \underline{-0.01x^2 + (p+5)x - 4500} \end{aligned}$$



Besten $p > 0$ slik at

$$\boxed{\begin{aligned} \pi(x) &< 0 \quad \text{for } x < 300 \\ \pi(x) &\geq 0 \quad \text{" } x > 300 \end{aligned}}$$

\Downarrow

Nærværende
betydelse:

$$\pi(300) = 0 \quad ; \quad -0.01 \cdot 300^2 + \frac{(p+5) \cdot 300}{300} - 4500 = 0$$

$$\frac{(p+5) \cdot 300}{300} = \frac{4500 + 900}{300}$$

$$p+5 = \frac{5400}{300} = 18$$

$$p = 18 - 5 = \underline{\underline{13}}$$

Spesifiser $p=13$:

$$\begin{aligned} \pi(x) &= -0.01x^2 + 18x - 4500 \\ &= -0.01(x^2 - 1800x + 900^2) - 4500 + \frac{0.01 \cdot 900^2}{8100} \\ &= \underline{\underline{-0.01(x-900)^2 + 3600}} \quad , 0 \leq x \leq 1000 \end{aligned}$$

