

Ma 3b/3c ongå räkning 1,2-2

1249/1272 a) $f(x) = 0$ då $x = 3$

b) $g(x) = 0 \quad x_1 = 2 \quad x_2 = -1$

c) $h(x) = 0 \quad x_1 = 0 \quad x_2 = -3 \quad x_3 = 3$

d) $k(x) = 0 \quad$ då $x_1 = -\sqrt{5} \quad x_2 = \sqrt{5}$

1250 $P(x) = (x-2)(x-5)$

1251/1273 a) $p(x) = x^2 - 14x + 13$

Lösn. hittar $x^2 - 14x + 13 = 0$ ger funktionens
nollställen $x^2 - 14x + 13 = 0$

$$x = 7 \pm \sqrt{7^2 - 13}$$

$$x = 7 \pm 6 \quad x_1 = 1 \quad x_2 = 13$$

$$\Rightarrow p(x) = (x-1)(x-13)$$

b) $q(x) = x^2 + 2x - 15$ Nollställen $q(x) = 0 \Rightarrow$

$$x^2 + 2x - 15 = 0$$

$$x = -1 \pm \sqrt{1^2 + 15}$$

$$x = -1 \pm 4 \quad x_1 = -5 \quad x_2 = 3$$

$$q(x) = (x+5)(x-3)$$

c) $r(x) = x^2 + 6x + 10$ Nollställen $r(x) = 0 \Rightarrow$

$$x^2 + 6x + 10 = 0$$

$$x = -3 \pm \sqrt{3^2 - 10}$$

$$x = -3 \pm \sqrt{-1} \Leftarrow \text{köre reella} \Rightarrow \text{Nollställen}$$

sätteras

Gör ej att faktorisera.

$$\frac{1252}{1274} \quad \text{Ex} \quad 2(x-4)(x-2) = \\ 2(x^2 - 6x + 8) = 2x^2 - 12x + 16$$

$$\underline{\underline{1253}} \quad a) \quad x_1 = 2 \quad x_2 = 5 \\ b) \quad x_1 = 0 \quad x_2 = -4 \quad x_3 = 1$$

$$\underline{\underline{1254}} \quad \text{Rötter} \quad x_1 = -3 \quad x_2 = -1 \quad x_3 = 1$$

$$\underline{\underline{1255}} \quad a) \quad x^3 - 8x^2 + 7x = 0 \\ x(x^2 - 8x + 7) = 0 \\ x_1 = 0 \quad x^2 - 8x + 7 = 0 \\ x = 4 \pm \sqrt{4^2 - 7} \\ x = 4 \pm 3 \\ x_2 = 1 \quad x_3 = 7$$

$$b) \quad 2x^4 + 12x^3 + 10x^2 = 0 \quad \text{Bryt ut största möjlig faktor}$$

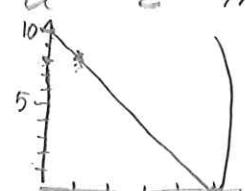
$$2x^2(x^2 + 6x + 5) = 0 \\ x_{1,2} = 0 \Rightarrow x^2 + 6x + 5 = 0 \\ x = -3 \pm \sqrt{3^2 - 5} \\ x = -3 \pm 2 \\ x_3 = -5 \quad x_4 = -1$$

$$\underline{\underline{1256}} \quad P(x) = a \cdot x + b \\ P(5) = 0 \Rightarrow a \cdot 5 + b = 0 \\ P(1) = 8 \Rightarrow a \cdot 1 + b = 8 \quad \begin{cases} 5a + b = 0 \\ a + b = 8 \end{cases} \quad *$$

Additonsmetoden

$$\begin{cases} 5a + b = 0 \\ -a - b = -8 \end{cases} \quad 4a = -8 \quad a = -2 \quad \text{ins. i } * \Rightarrow -2 + b = 8 \quad b = 10$$

(Alt. rita och lös grafiskt)



Polynomet är
 $P(x) = -2x + 10$

$$1257 \quad P(x) = a \cdot (x - (-1))(x - 3) = a(x+1)(x-3)$$

$$P(2) = -6 \Rightarrow a(2+1)(2-3) = -6$$

$$a \cdot 3 \cdot (-1) = -6$$

$$a \cdot (-3) = -6$$

$$a = \frac{-6}{-3}$$

$$a = 2$$

$$P(x) = 2(x+1)(x-3)$$

1258/1275 Andragrade Polynom nullstellen $x = -5 \leq x = 2$

$$P(x) = a \cdot (x+5)(x-2)$$

$$P(0) = -10 \Rightarrow a(0+5)(0-2) = -10$$

$$a \cdot 5 \cdot (-2) = -10$$

$$a \cdot (-1) = -10$$

$$a = 1$$

$$P(x) = (x+5)(x-2) = x^2 + 3x - 10$$

1259/1277 $P(x) = a \cdot (x+2)(x-1)(x-2)$

$$P(0) = -8 \Rightarrow a(0+2)(0-1)(0-2) = -8$$

$$a \cdot 4 = -8$$

$$a = -2$$

$$P(x) = -2(x+2)(x-1)(x-2) = -2(x+2)(x-2)(x-1) =$$

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

$$-2x^3 + 2x^2 + 8x - 8$$

$$1260 \quad a) \text{Lös grafiskt} \Rightarrow x_1 = 2 \quad x_2 = 4 \quad x_3 = 9$$

b) $p(x) = (x-2)(x-4)(x-9)$

$$1261 \quad \text{Nollställen} \quad x_1 = -1 \quad x_2 = 1 \quad x_3 = 10$$

$$P(x) = a(x+1)(x-1)(x-10)$$

$$P(0) = -1 \quad \Rightarrow a \cdot (0+1)(0-1)(0-10) = -1$$

$$a \cdot 10 = -1$$

$$a = -0,1$$

$$P(x) = -0,1(x+1)(x-1)(x-10) \quad \text{OBS fel i facit!}$$

$$1262 \quad (x-5)(x^2+4x+3) = 0$$

$$\begin{aligned} x_1 &= 5 \quad \because x^2 + 4x + 3 = 0 \\ &= x = -2 \pm \sqrt{2^2 - 3} \\ &= -2 \pm 1 \\ x_2 &= -3 \quad x_3 = -1 \end{aligned}$$

$$1263 / 1278 \quad \text{Klara har rätt}$$

$P(0) = 0$ innebär att polynomet har 3 nollställen \Rightarrow tredjegradspolynom

$$1264 \quad \text{Ex. } P(x) = (x-7)(x-2)^2$$

$$1265 \quad a) \quad r(z) = -z^3 + 4z^2 - 3z = -z(z^2 - 4z + 3) = -z(z-3)(z-1)$$

$$(1279) \quad b) \quad q(y) = 2y^2 - 14y - 36 = 2(y^2 - 7y - 18) = 2(y-9)(y+2)$$

$$\therefore P(x) = -x^3 + 10x^2 + 25 = -(x^3 - 10x^2 - 25) = -(x - (5+5\sqrt{2}))(x - (5-5\sqrt{2}))$$

$$x^3 - 10x^2 - 25 = 0 \Rightarrow x = 5 \pm \sqrt{5^2 + 25} = 5 \pm \sqrt{50} = 5 \pm 5\sqrt{2}$$

$$\begin{array}{l} \cancel{1266} \quad P(x) = 5x(x-2)^3 - 2(x+2)^3 = \\ \cancel{1280} \quad (5x-2)(x+2)^3 \quad \text{Nollstellen} \end{array}$$

$$5x-2=0 \quad \text{och} \quad x+2=0 \Rightarrow x=-2 \quad \text{trippelrot}$$

$$\Rightarrow 5x=2$$

$$x = \frac{2}{5}$$

$$x=0,4$$

$$\begin{matrix} \text{Svar} & x=0,4 \\ = & \\ & x=-2 \end{matrix}$$

$$\begin{array}{l} \cancel{1267} \quad P(x) = 2x^3 - 37x^2 + 176x - 240 \\ \cancel{1281} \end{array}$$

a) Bestäm grafiskt $x_1 = 2,5$ $x_2 = 4$ $x_3 = 12$

b) $P(x) = 2(x-2,5)(x-4)(x-12)$

$$\begin{array}{l} \cancel{1268} \quad (x-a) \text{ faktor i polynomet } P(x) \Rightarrow \\ \cancel{1281} \quad P(x) = (x-a) \cdot q(x) \end{array}$$

$$P(a) = (a-a) \cdot q(x) = 0 \cdot q(x) = 0$$

Dvs. årenfaktor i polynomet $(x-a)$ sätter

$$\bar{a} \text{ är } P(a) = 0 \quad V.S.V.$$

$$\begin{array}{l} \cancel{1269} \quad P(x) \text{ skär ej } x\text{-axeln utan tangentar i } x=4 \\ \cancel{1282} \end{array}$$

b) $q(x) = (x+1)^2(x-2)$

$$\begin{array}{l} \cancel{1270} \quad \cancel{1283} \quad P(x) = a \cdot (x+1)(x-3)^2 \end{array}$$

$$P(1) = 16 \Rightarrow a \cdot (1+1)(1-3)^2 = 16$$

$$a \cdot 2 \cdot 4 = 16$$

$$8a = 16$$

$$a = 2$$

$$P(x) = 2 \cdot (x+1)(x-3)^2$$

$$127) p(x) = -x^4 + 3x^3 + 68x^2 + 6x + 140$$

a) Grafisk bestämnings $x_1 = -7$ $x_2 = 10$

$$\therefore p(x) = (x+7)(x-10)(x^2+2)$$

c) Faktorm x^2+2 saknar reella nollställen
 $x^2+2 > 0$ för alla värden på x .

$$128) \underline{p(x)} = 2x^4 + 3x^3 - 92x^2 - 108x + 720$$

Grafisk bestämnings $x_1 = -6$ $x_2 = -4$ $x_3 = 2,5$ $x_4 = 6$

$$p(x) = 2(x+6)(x+4)(x-2,5)(x-6)$$