

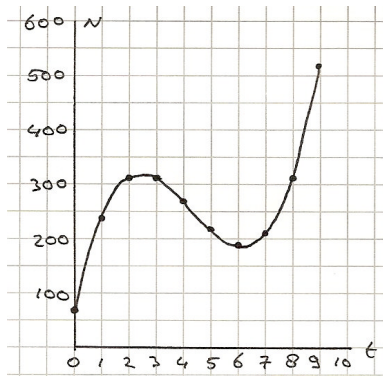
GEMENGDE OPGAVEN H3: De afgeleide functie.

Opgave 21:

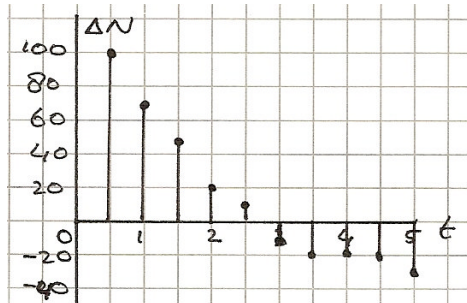
a.

jaar	N	ΔN
1995	70	
1996	240	170
1997	310	70
1998	310	0
1999	270	-40
2000	220	-50
2001	190	-30
2002	210	20
2003	310	100
2004	520	210

b.



c.



- d. $N(1) = 215$ i.p.v. 240
 $N(2) = 270$ i.p.v. 310

Opgave 22:

a. $\left[\frac{ds}{dt} \right]_{t=15} = 15,36 \frac{m}{s} = 55,3 \frac{km}{uur}$

$$\left[\frac{ds}{dt} \right]_{t=30} = 7,1 \frac{m}{s} = 25,6 \frac{km}{uur}$$

b. $s(50) = 431$

$$v(50) = \left[\frac{ds}{dt} \right]_{t=50} = 2,378 \frac{m}{s}$$

$$s(60) = 431 + 10 \cdot 2,378 = 454,8 \text{ m}$$

Opgave 23:

a. $y_A = f(-4) = -14$

$$rc = \left[\frac{dy}{dx} \right]_{x=-4} = 19$$

$$y = 19x + b \text{ door } (-4, -14)$$

$$-14 = -76 + b$$

$$b = 62$$

$$l: y = 19x + 62$$

b. $y_B = f(0) = 2$

$$rc = \left[\frac{dy}{dx} \right]_{x=0} = 1,44$$

$$y = 1,44x + b \text{ door } (0, 2)$$

$$2 = b$$

$$k: y = 1,44x + 2$$

c. $y_C = f(8) = 9,2$

$$rc = \left[\frac{dy}{dx} \right]_{x=8} = 0,632$$

$$y = 0,632x + b \text{ door } (8; 9,2)$$

$$9,2 = 5,056 + b$$

$$4,144 = b$$

$$m: y = 0,632x + 4,144$$

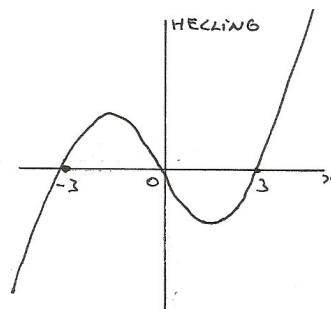
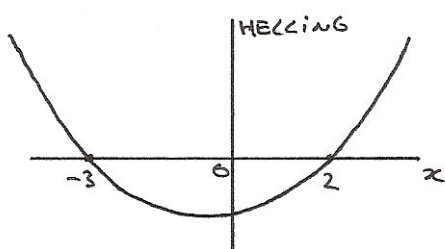
$$0,632x + 4,144 = 0$$

$$0,632x = -4,144$$

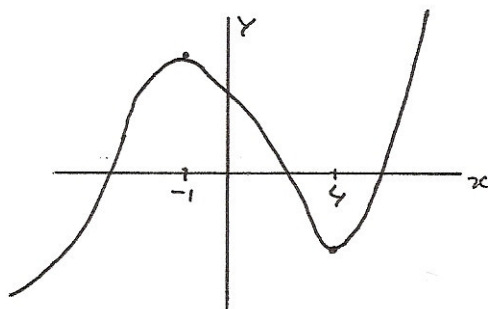
$$x = \frac{-4,144}{0,632} = -6,56$$

Opgave 24:

a.



b.



Opgave 25:

a. $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h} =$
 $\lim_{h \rightarrow 0} \frac{3(x+h)^2 + 5(x+h) + 6 - (3x^2 + 5x + 6)}{h} =$
 $\lim_{h \rightarrow 0} \frac{3(x^2 + 2hx + h^2) + 5x + 5h + 6 - 3x^2 - 5x - 6}{h} =$
 $\lim_{h \rightarrow 0} \frac{3x^2 + 6hx + 3h^2 + 5x + 5h + 6 - 3x^2 - 5x - 6}{h} =$
 $\lim_{h \rightarrow 0} \frac{6hx + 3h^2 + 5h}{h} =$
 $\lim_{h \rightarrow 0} 6x + 3h + 5 = 6x + 0 + 5 = 6x + 5$

b. $g'(x) = \lim_{h \rightarrow 0} \frac{g(x+h) - g(x)}{h} =$
 $\lim_{h \rightarrow 0} \frac{(x+h)^3 - x^3}{h} =$
 $\lim_{h \rightarrow 0} \frac{x^3 + 3x^2h + 3xh^2 + h^3}{h} =$
 $\lim_{h \rightarrow 0} \frac{3x^2h + 3xh^2}{h} =$
 $\lim_{h \rightarrow 0} 3x^2 + 3xh = 3x^2 + 0 = 3x^2$

Opgave 26:

a. $f(x) = -x(2x - 7) = -2x^2 + 7x$
 $f'(x) = -4x + 7$

b. $g(x) = (x^2 - 1)(x - 1) = x^3 - x^2 - x + 1$
 $g'(x) = 3x^2 - 2x - 1$

c. $h(x) = x(3x + 2)^2 = x(9x^2 + 12x + 4) = 9x^3 + 12x^2 + 4x$
 $h'(x) = 27x^2 + 24x + 4$

d. $m(t) = 7 - \frac{t^2 + 8t}{16} = 7 - \frac{1}{16}t^2 - \frac{1}{2}t$
 $m'(t) = -\frac{1}{8}t - \frac{1}{2}$

e. $k(a) = 8 - (a - 1)^2 = 8 - (a^2 - 2a + 1) = 8 - a^2 + 2a - 1$
 $k'(a) = -2a + 2$

f. $p(x) = 5x - x(2x + 5)(x - 3) = 5x - x(2x^2 - x - 15) = 5x - 2x^3 + x^2 + 15x =$
 $-2x^3 + x^2 + 20x$
 $p'(x) = -6x^2 + 2x + 20$

Opgave 27:

$f(x) = (x^2 - 9)(x - 1) = x^3 - x^2 - 9x + 9$

a. $f'(x) = 3x^2 - 2x - 9$

$$rc = f'(2) = -1$$

$$y_A = f(2) = -5$$

$$y = -x + b \text{ door } (2, -5)$$

$$-5 = -2 + b$$

$$b = -3$$

$$k: y = -x - 3$$

b. $B(0,9)$

$$rc = f'(0) = -9$$

$$y = -9x + b \text{ door } (0,9)$$

$$9 = b$$

$$m: y = -9x + 9$$

c. $f'(-1) = -4 \neq 0$ dus de raaklijn is niet horizontaal.

Opgave 28:

a. $A(0,1)$

$$f'(x) = x^2 - x - 2$$

$$rc = f'(0) = -2$$

$$y = -2x + b \text{ door } (0,1)$$

$$1 = b$$

$$k: y = -2x + 1$$

b. $f'(x) = x^2 - x - 2 = 0$

$$(x-2)(x+1) = 0$$

$$x = 2 \quad \vee \quad x = -1$$

$$y = -2\frac{1}{3} \quad \vee \quad y = 2\frac{1}{6}$$

$$(2, -2\frac{1}{3}) \text{ en } (-1, 2\frac{1}{6})$$

c. $f'(x) = x^2 - x - 2 = 4$

$$x^2 - x - 6 = 0$$

$$(x-3)(x+2) = 0$$

$$x = 3 \quad \vee \quad x = -2$$

$$y = -\frac{1}{2} \quad \vee \quad y = \frac{1}{3}$$

$$(3, -\frac{1}{2}) \text{ en } (-2, \frac{1}{3})$$

Opgave 29:

a. $f(x) = (x^2 + 2)(1 - x) = -x^3 + x^2 - 2x + 2$

$$f'(x) = -3x^2 + 2x - 2$$

$$y_A = f(2) = -6$$

$$rc = f'(2) = -10$$

$$y = -10x + b \text{ door } (2, -6)$$

$$-6 = -20 + b$$

$$b = 14$$

$$k: y = -10x + 14$$

b. $rc = f'(x) = -3x^2 + 2x - 2 = -10$

$$-3x^2 + 2x + 8 = 0$$

$$x = \frac{-2 \pm \sqrt{4+96}}{-6} = \frac{-2 \pm 10}{-6}$$

$$x = \frac{-2-10}{-6} = 2 \quad \vee \quad x = \frac{-2+10}{-6} = -1\frac{1}{3}$$

Opgave 30:

- a. $v(t) = s'(t) = 0,18t^2 + 2,4t$
 $v(4) = s'(4) = 12,48 \text{ m/s} = 45 \text{ km/uur}$
 $v(6) = s'(6) = 15,48 \text{ m/s} = 56 \text{ km/uur}$
- b. $100 \text{ km/uur} = 27,8 \text{ m/s}$
 $0,18t^2 + 2,4t = 27,8$
 $y_1 = 0,18x^2 + 2,4x$ en $y_2 = 27,8$
 calc-menu optie intersection geeft $x = 7,43$
 dus na 7,43 sec.
- c. $s(8) = 107,52$
 $v(8) = s'(8) = 30,72$
 $107,52 + 30,72x = 300$
 $30,72x = 192,48$
 $x = 6,3$
 dus na $t = 6,3 + 8 = 14,3$ sec.