

HAVO WISKUNDE B 2017 TIJDVAK 2.

Opgave 1:

$$\frac{1}{2}x^3 - 4x = 0$$

$$\frac{1}{2}x(x^2 - 8) = 0$$

$$x = 0 \quad \vee \quad x^2 = 8$$

$$x = 0 \quad \vee \quad x = -\sqrt{8} \quad \vee \quad x = \sqrt{8}$$

$$MN = 2\sqrt{8} = 4\sqrt{2}$$

Opgave 2:

$$f'(x) = 1\frac{1}{2}x^2 - 4$$

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

$$k: y = 2x + b \quad \text{door } (-2,4)$$

$$4 = -4 + b$$

$$b = 8$$

$$k: y = 2x + 8$$

lijn m gaat door O en staat loodrecht op lijn k

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

$$m: y = -\frac{1}{2}x$$

$$2x + 8 = -\frac{1}{2}x$$

$$2\frac{1}{2}x = -8$$

$$x = -3,2$$

$$y = 1,6$$

$$d(O, k) = \sqrt{3,2^2 + 1,6^2} = \frac{8}{5}\sqrt{5}$$

$$d(k, l) = \frac{16}{5}\sqrt{5} = 7,16$$

Opgave 3:

$$rc_{MD} = \frac{8-5}{4-0} = \frac{3}{4}$$

lijn k staat loodrecht op MD dus $rc_k = -\frac{4}{3}$

$$k: y = -\frac{4}{3}x + b \quad \text{door } (4,8)$$

$$8 = -\frac{16}{3} + b$$

$$b = 13\frac{1}{3}$$

$$y = -\frac{4}{3}x + 13\frac{1}{3}$$

$$-\frac{4}{3}x + 13\frac{1}{3} = 0$$

$$-\frac{4}{3}x = -13\frac{1}{3}$$

$$x = 10$$

$$B(10,0)$$

Opgave 4:

$$BD = \sqrt{(10 - 4)^2 + (0 - 8)^2} = 10$$

$$rc_{MD} = \frac{3}{4} = \tan \alpha$$

$$\alpha = 36,9^\circ$$

$$\angle CMD = 180 - 2 \cdot 36,9 = 106,26^\circ$$

$$\text{boog } CD = \frac{106,26}{360} \cdot 2\pi \cdot 5 = 9,27$$

$$\text{touwtje} = 2 \cdot 10 + 9,27 = 29,3$$

Opgave 5:

$$g_{10 \text{ jaar}} = 1,02 \cdot 1,01 \cdot 1,07 \cdot 1,14 \cdot 1,26 \cdot 1,03 \cdot 1,03 \cdot 1,05 \cdot 1,08 \cdot 1,06 = 2,02$$

dit is ongeveer 2 dus in 10 jaar verdubbeld

Opgave 6:

$$g^{10} = 2$$

$$g = \sqrt[10]{2} = 1,072$$

dus een toename van 7,2%

Opgave 7:

$$\frac{19,9 \cdot 2250}{7} \left(\left(1 + \frac{7}{100} \right)^t - 1 \right) = 13000$$

$$\frac{44775}{7} (1,07^t - 1) = 13000$$

$$y_1 = \frac{44775}{7} (1,07^x - 1) \text{ en } y_2 = 13000 \text{ intersect geeft: } x = 16,39$$

dus na 17 jaar

Opgave 8:

maand	jan	feb	mrt	apr	mei	Jun
toename	275	850	2575	525	1850	-975
productie	795	1645	4220	4745	6595	5620

totaal eerste helft van het jaar: 23620

dus $45000 - 5000 - 23620 = 16380$

dus 16400

Opgave 9:

$$f(x) = \frac{2x^2 + 18}{3x} = \frac{2}{3}x + \frac{6}{x} = \frac{2}{3}x + 6x^{-1}$$

$$f'(x) = \frac{2}{3} - 6x^{-2} = \frac{2}{3} - \frac{6}{x^2} = 0$$

$$\frac{6}{x^2} = \frac{2}{3}$$

$$2x^2 = 18$$

$$x^2 = 9$$

$$x = 3 \vee x = -3$$
$$(3,4) \text{ en } (-3,-4)$$

Opgave 10:

$$1 - 2 \sin(\pi x) = 0$$

$$-2 \sin(\pi x) = -1$$

$$\sin(\pi x) = \frac{1}{2}$$

$$\pi x = \frac{1}{6}\pi + k \cdot 2\pi \vee \pi x = \frac{5}{6}\pi + k \cdot 2\pi$$

$$x = \frac{1}{6} + k \cdot 2 \vee x = \frac{5}{6} + k \cdot 2$$

$$x = \frac{1}{6} \vee x = \frac{5}{6}$$

Opgave 11:

$$\text{periode van } f \text{ is } \frac{2\pi}{\pi} = 2$$

$$\text{toppen voor } x_P = \frac{1}{2} \text{ en } x_Q = 1\frac{1}{2}$$

$$y_P = 1 - 2 = -1 \text{ en } y_Q = 1 + 2 = 3$$

$$P\left(\frac{1}{2}, -1\right) \text{ en } g\left(\frac{1}{2}\right) = -1 + \sqrt{0} = -1 \text{ dus punt } P \text{ op de grafie van } g$$

$$Q\left(1\frac{1}{2}, 3\right) \text{ en } g(3) = -1 + \sqrt{16} = 3 \text{ dus punt } Q \text{ op de grafiek van } g$$

Opgave 12:

$$-1 + \sqrt{16x - 8} = 0$$

$$\sqrt{16x - 8} = 1$$

$$16x - 8 = 1$$

$$16x = 9$$

$$x = \frac{9}{16}$$

$$g'(x) = \frac{1}{2\sqrt{16x-8}} \cdot 16 = \frac{8}{\sqrt{16x-8}}$$

$$g'\left(\frac{9}{16}\right) = \frac{8}{1} = 8$$

Opgave 13:

$$4 \text{ tegels: } \frac{1}{2} + \frac{1}{4} + \frac{1}{6} = \frac{11}{12} < 1$$

$$5 \text{ tegels: } \frac{1}{2} + \frac{1}{4} + \frac{1}{6} + \frac{1}{8} = \frac{25}{24} > 1$$

dus bij 5 tegels

Opgave 14:

$$34,54 \log(n - 1) + 8,658 + \frac{15}{2(n - 1)} + \frac{5}{4(n - 1)^2} = 100$$

$$y_1 = 34,54 \log(n - 1) + 8,658 + \frac{15}{2(x-1)} + \frac{5}{4(x-1)^2} \text{ en } y_2 = 100 \text{ intsect geeft}$$

$$x = 441,6$$

dus 442 tegels

Opgave 15:

formule 1 – formule 2 < 0,1

$$\frac{15}{2(n-1)} + \frac{5}{4(n-1)^2} < 0,1$$

$$y_1 = \frac{15}{2(x-1)} + \frac{5}{4(x-1)^2} \text{ en } y_2 = 0,1 \text{ intsect geeft: } x = 76,2$$

dus $n = 77$

Opgave 16:

$$\sqrt{1500 - \frac{15}{16}(x-10)^2} = 0$$

$$1500 - \frac{15}{16}(x-10)^2 = 0$$

$$\frac{15}{16}(x-10)^2 = 1500$$

$$(x-10)^2 = 1600$$

$$x-10 = 40 \quad \vee \quad x-10 = -40$$

$$x = 50 \quad \vee \quad x = -30$$

dus perihelium is 30 en aphelium is 50

Opgave 17:

r is maximaal als $\cos \alpha = -1$

$$\text{dus } r = \frac{37,5}{1-0,25} = 50$$

r is minimaal als $\cos \alpha = 1$

$$\text{dus } r = \frac{37,5}{1+0,25} = 30$$

Opgave 18:

$$R(-4,5)$$

$$r_c = 7$$

$$T(p, 0)$$

$$RT = \sqrt{(p - -4)^2 + (0 - 5)^2}$$

$$= \sqrt{(p + 4)^2 + 25}$$

$$= \sqrt{p^2 + 8p + 16 + 25}$$

$$= \sqrt{p^2 + 8p + 41}$$

Opgave 18:

$$r_e = RT - 7 = \sqrt{p^2 + 8p + 41} - 7$$

$$r_e = ST - 4 = \sqrt{p^2 - 28p + 260}$$

$$\sqrt{p^2 + 8p + 41} - 7 = \sqrt{p^2 - 28p + 260} - 4$$

$$y_1 = \sqrt{x^2 + 8x + 41} - 7 \text{ en } y_2 = \sqrt{x^2 - 28x + 260} - 4 \text{ intsect geeft } x = 8 \text{ en } y = 6$$

dus $r_e = 6$