

## HAVO WISKUNDE B 2018 TIJDVAK 2

### Opgave 1:

$$n = 1 \quad f = 27,5$$

$$n = 49 \quad f = 440$$

$$g^{48} = \frac{440}{27,5} = 16$$

$$g = \sqrt[48]{16} = 1,0595$$

Dus een toename van 5,95%.

### Opgave 2:

$$440 \cdot 2^{\frac{1}{12}(m-69)} = 20$$

$Y_1 = 440 \cdot 2^{\frac{1}{12}(x-69)}$  en  $Y_2 = 20$  intsect geeft:  $x = 15,5$  dus begin met 16

$Y_3 = 20000$  intsect met  $Y_1$  geeft:  $x = 135,1$  dus eindig met 135

dus  $135 - 16 + 1 = 120$  toetsen

### Opgave 3:

$l: y = -x + b$  door (4,4)

$$4 = -4 + b$$

$$b = 8$$

$$y = -x + 8$$

$c$  en  $l$  snijden geeft:

$$x^2 + (-x + 8)^2 - 10x + 16(-x + 8) = 56$$

$$x^2 + x^2 - 16x + 64 - 10x - 16x + 128 = 56$$

$$2x^2 - 42x + 136 = 0$$

$$x^2 - 21x + 68 = 0$$

$$(x - 4)(x - 17) = 0$$

$$x = 4 \quad \vee \quad x = 17$$

$$y = -9$$

$B(17, -9)$

### Opgave 4:

$$x^2 + y^2 - 10x + 16y = 56$$

$$(x - 5)^2 - 25 + (y + 8)^2 - 64 = 56$$

$$(x - 5)^2 + (y + 8)^2 = 145$$

$$M = (5, -8)$$

$$rc_{MD} = \frac{0 - -8}{14 - 5} = \frac{8}{9}$$

$$\tan \alpha = \frac{8}{9}$$

$$\alpha = 41,6^\circ$$

vanwege symmetrie geldt:  $\beta = -41,6^\circ$

$$\angle CMD = 180^\circ - 2 \cdot 41,6^\circ = 96,7^\circ$$

**Opgave 5:**

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

$D = 9 - 12 = -3$  dus geen oplossingen

dus er is geen verticale asymptoot

**Opgave 6:**

$${}^2\log(x^2 - 3x + 3) = 0$$

$$x^2 - 3x + 3 = 1$$

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

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

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

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

**Opgave 7:**

$$\frac{\sin \angle B}{AC} = \frac{\sin \angle BCA}{AB}$$

$$\frac{\sin 55^\circ}{5} = \frac{\sin \angle BCA}{6}$$

$$\sin \angle BCA = \frac{6 \sin 55^\circ}{5} = 0,983$$

$$\angle BCA = 79,415^\circ \quad \vee \quad \angle BCA = 100,585^\circ$$

$$\angle BAC = 180^\circ - 55^\circ - 100,585^\circ = 24,415^\circ$$

**Opgave 8:**

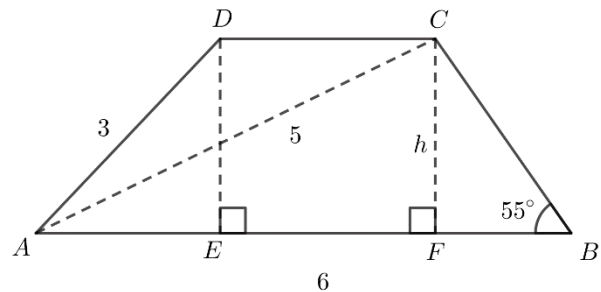
$$\sin 24,41^\circ = \frac{h}{5}$$

$$h = 5 \cdot \sin 24,41^\circ = 2,066$$

$$AE = \sqrt{3^2 - 2,066^2} = 2,175$$

$$\tan 55^\circ = \frac{2,066}{BF}$$

$$BF = \frac{2,066}{\tan 55^\circ} = 1,447$$

**Opgave 9:**

$$Y_1 = 0,00623x^3 - 0,58274x^2 + 16,47524x - 46,76666$$

optie max geeft:  $x = 21,66$

$$f(19,66) = 99,24$$

$$f(23,66) = 99,33$$

Dus de productiviteit neemt het meest af bij twee graden daling t.o.v. de ideale temperatuur.

**Opgave 10:**

$$P(30) = 91,23454$$

$$P(35) = 83,12149$$

$$a = \frac{\Delta P}{\Delta T} = \frac{83,12149 - 91,23454}{35 - 30} = -1,623$$

$$P = -1,623T + b \quad \text{door } (30 ; 91,23454)$$

$$91,23454 = -1,623 \cdot 30 + b$$

$$b = 139,9$$

**Opgave 11:**

$$3 \sin(\pi x) = \frac{3}{2}$$

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

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

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

$$x_P = \frac{1}{6} \quad \text{en} \quad x_Q = \frac{5}{6}$$

**Opgave 12:**

$$3 \sin(\pi x) = 0$$

$$\sin(\pi x) = 0$$

$$\pi x = 0 + k \cdot \pi$$

$$x = 0 + k \cdot 1$$

$$A(1,0) \text{ dit geeft } a + b = 0$$

$$x_T = \frac{1}{2} \text{ en de amplitude is } 3 \text{ dus } y_T = 3$$

$$T\left(\frac{1}{2}, 3\right) \text{ dit geeft } \frac{1}{8}a + \frac{1}{2}b = 3$$

**Opgave 13:**

$$a + b = 0 \quad \text{dus} \quad b = -a$$

$$\frac{1}{8}a + \frac{1}{2} \cdot -a = 3$$

$$-\frac{3}{8}a = 8$$

$$a = -8$$

$$b = 8$$

**Opgave 14:**

$$x + \frac{1}{x} = \frac{x}{4} + \frac{4}{x}$$

$$x + \frac{1}{x} = \frac{1}{4}x + \frac{4}{x}$$

$$\frac{3}{4}x = \frac{3}{x}$$

$$\frac{3}{4}x^2 = 3$$

$$x^2 = 4$$

$$x = 2 \quad (x = -2 \text{ ligt niet in het domein})$$

**Opgave 15:**

$$h(x) = \frac{x}{a} + \frac{a}{x} = \frac{1}{a}x + ax^{-1}$$

$$h'(x) = \frac{1}{a} - ax^{-2} = \frac{1}{a} - \frac{a}{x^2} = \frac{x^2}{ax^2} - \frac{a^2}{ax^2} = \frac{x^2 - a^2}{ax^2}$$

**Opgave 16:**

$$h'(x) = \frac{x^2 - a^2}{ax^2} = 0$$

$$x^2 - a^2 = 0$$

$$x^2 = a^2$$

$$h(a) = \frac{a}{a} + \frac{a}{a} = 1 + 1 = 2$$

**Opgave 17:**

$$\frac{3}{16x^4} = \frac{1}{32}$$

$$16x^4 = 96$$

$$x^4 = 6$$

$$x = \sqrt[4]{6} \quad \vee \quad x = -\sqrt[4]{6}$$

dus de afstand tussen de twee punten is:  $2\sqrt[4]{6}$

**Opgave 18:**

$$f(x) = \frac{3}{16x^4} = \frac{3}{16}x^{-4}$$

$$f'(x) = -\frac{3}{4}x^{-5} = -\frac{3}{4x^5}$$

$$f'(1) = -\frac{3}{4}$$

$$y = -\frac{3}{4}x + b \quad \text{door } (1, \frac{3}{16})$$

$$\frac{3}{16} = -\frac{3}{4} + b$$

$$b = \frac{15}{16} \quad \text{dus } y_B = \frac{15}{16}$$