① $f(x) = \dfrac{4x}{2+x^2}$ extremum $\rightarrow f'(x) = 0$

$\dfrac{d}{dx}\left(\dfrac{f(x)}{g(x)}\right) = \dfrac{g \cdot f' - f \cdot g'}{g^2}$

$f'(x) = \dfrac{(2+x^2)4 - (4x) \cdot (2x)}{(2+x^2)^2}$

$= \dfrac{8 + 4x^2 - 8x^2}{(2+x^2)^2} = \dfrac{8 - 4x^2}{(2+x^2)^2} = 0$

$\Rightarrow 8 - 4x^2 = 0 \Rightarrow x^2 = \dfrac{8}{4} \Rightarrow x = \pm\sqrt{2}$

$x = \sqrt{2}$ Ⓒ

② $\cos x \,(\text{tg}\, x + \text{cotg}\, x) = 4$

$\cos x \left(\dfrac{\sin x}{\cos x} + \dfrac{\cos x}{\sin x} \right) = 4$

$\cancel{\cos} x \left(\dfrac{\sin^2 x + \cos^2 x}{\cancel{\cos x} \cdot \sin x} \right) = 4$

$\dfrac{1}{\sin x} = 4$ Ⓐ

③ $\dfrac{x+1}{2y+1} = 1$ en $\dfrac{x+2}{2y+1} = 3$

? $x + 2y = $?

$\begin{cases} x + 1 = 2y + 1 \\ x + 2 = 3(2y+1) \end{cases}$

$\begin{cases} x + 1 = 2y + 1 \\ x + 2 = 6y + 3 \end{cases}$ $\quad$ (-1)

$\overline{\quad\quad\quad\quad\quad\quad\quad\quad}$

$0 - 1 = -4y - 2$

$4y = -1 \implies \boxed{y = -\dfrac{1}{4}}$

$x + 1 = 2y + 1$

$x = 2y = -\dfrac{2}{4}$

$\implies x + 2y = -\dfrac{2}{4} + 2\left(-\dfrac{1}{4}\right) = -1$

④ $H = 18$ $\quad q = \dfrac{8}{10}$ $\qquad 6 \text{st} \Rightarrow \dfrac{10}{10}$

$$q = \dfrac{\sum\limits_{\mu=1}^{18} x_\mu}{18} = \dfrac{6 \cdot \dfrac{10}{10} + \dfrac{x}{10}}{18} = \dfrac{8}{10}$$

$$\Rightarrow \quad \dfrac{60}{10} + \dfrac{x}{10} = \dfrac{8 \cdot 18}{10}$$

$$60 + x = 144 \quad \Rightarrow \quad x = 84$$

= de som van de punten
van 12 studenten !

$$\Rightarrow \text{gemiddeld} = \dfrac{84}{12} = 7 \quad \boxed{B}$$

⑤ $y = 3x^3 - 3x - 18$? opp onder x

nulpunten $x = \dfrac{3 \pm \sqrt{3^2 - 4 \cdot 3 \cdot (-18)}}{2 \cdot 3}$

$x = \dfrac{1}{2} \pm \dfrac{\sqrt{9 + 216}}{6} = \dfrac{1}{2} \pm \dfrac{\sqrt{225}}{6}$

$x = \dfrac{1}{2} \pm \dfrac{15}{6} = \dfrac{1}{2} \pm \dfrac{5}{2}$

$x = \begin{cases} 6/2 = 3 \\ -4/2 = -2 \end{cases}$

$\displaystyle\int_{-2}^{3} (3x^2 - 3x - 18)\,dx = x^3 - \dfrac{3}{2}x^2 - 18x \Big|_{-2}^{3}$

$= \left[3^3 - \dfrac{3}{2}3^2 - 18 \cdot 3 \right] - \left[(-2)^3 - \dfrac{3}{2}(-2)^2 + 18 \cdot 2 \right]$

$= \left[27 - \dfrac{27}{2} - 54 \right] - \left[-8 - 6 + 36 \right]$

$= \left[\dfrac{27 - 108}{2} \right] - 22 = -\dfrac{81}{2} - \dfrac{44}{2}$

$= -\dfrac{125}{2} = -62{,}5$

opp $= 62{,}5$

Ⓑ
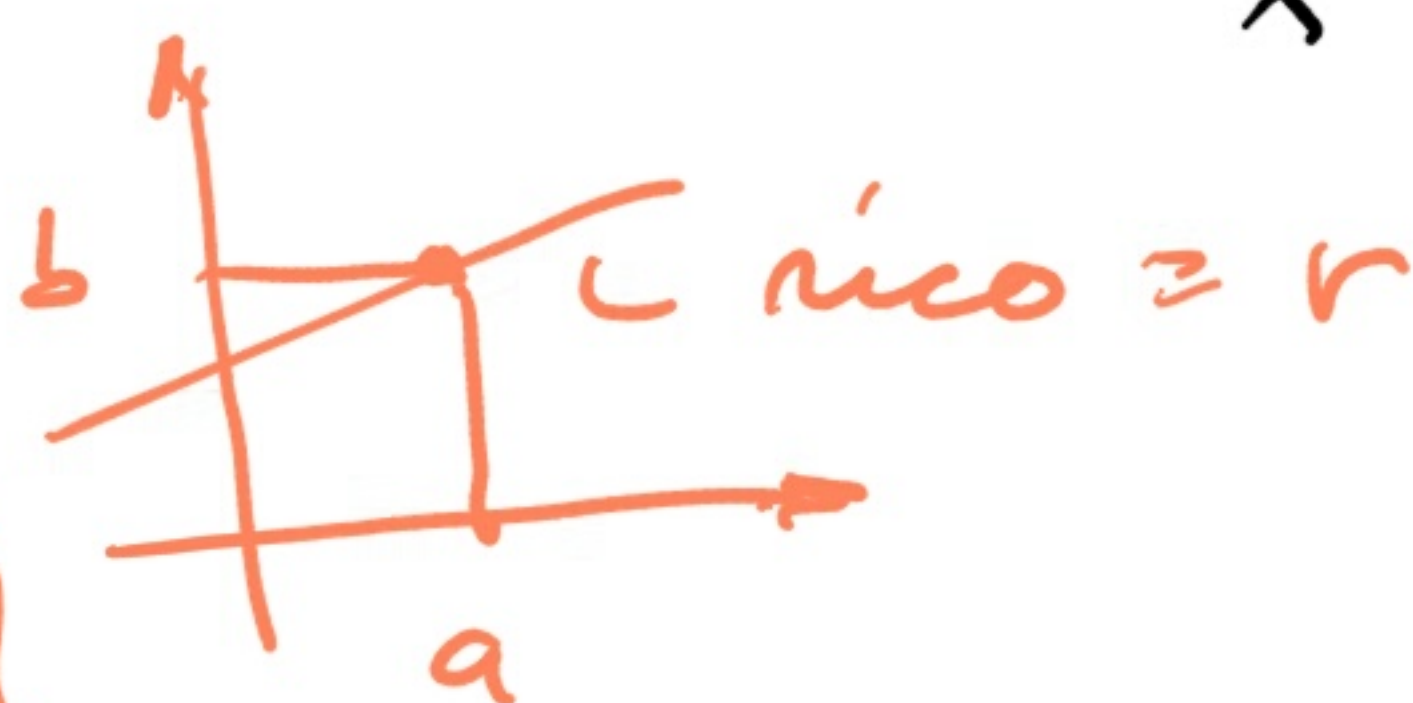
⑥ $f(x) = \dfrac{\ln x}{x^2}$ met $x > 0$

? raaklijn in $(e, f(e))$ snijdt de x-as waar?

$f(e) = \dfrac{\ln e}{e^2} = \dfrac{1}{e^2}$

$$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{g \cdot f' - f \cdot g'}{g^2}$$

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

$f'(x) = \dfrac{1 - 2\ln x}{x^3}$

rico = r

$(y - b) = r(x - a)$

$y = rx - ra + b$ — $f(e)$

$\to e$

$f'(e) = \dfrac{1 - 2\ln e}{e^3}$

$= \dfrac{1 - 2 \cdot 1}{e^3} = -\dfrac{1}{e^3} = $ rico

$\Rightarrow y = -\dfrac{1}{e^3}x + \dfrac{1}{e^3} \cdot e + \dfrac{1}{e^2}$

$y = -\dfrac{1}{e^3}x + \dfrac{2}{e^2}$
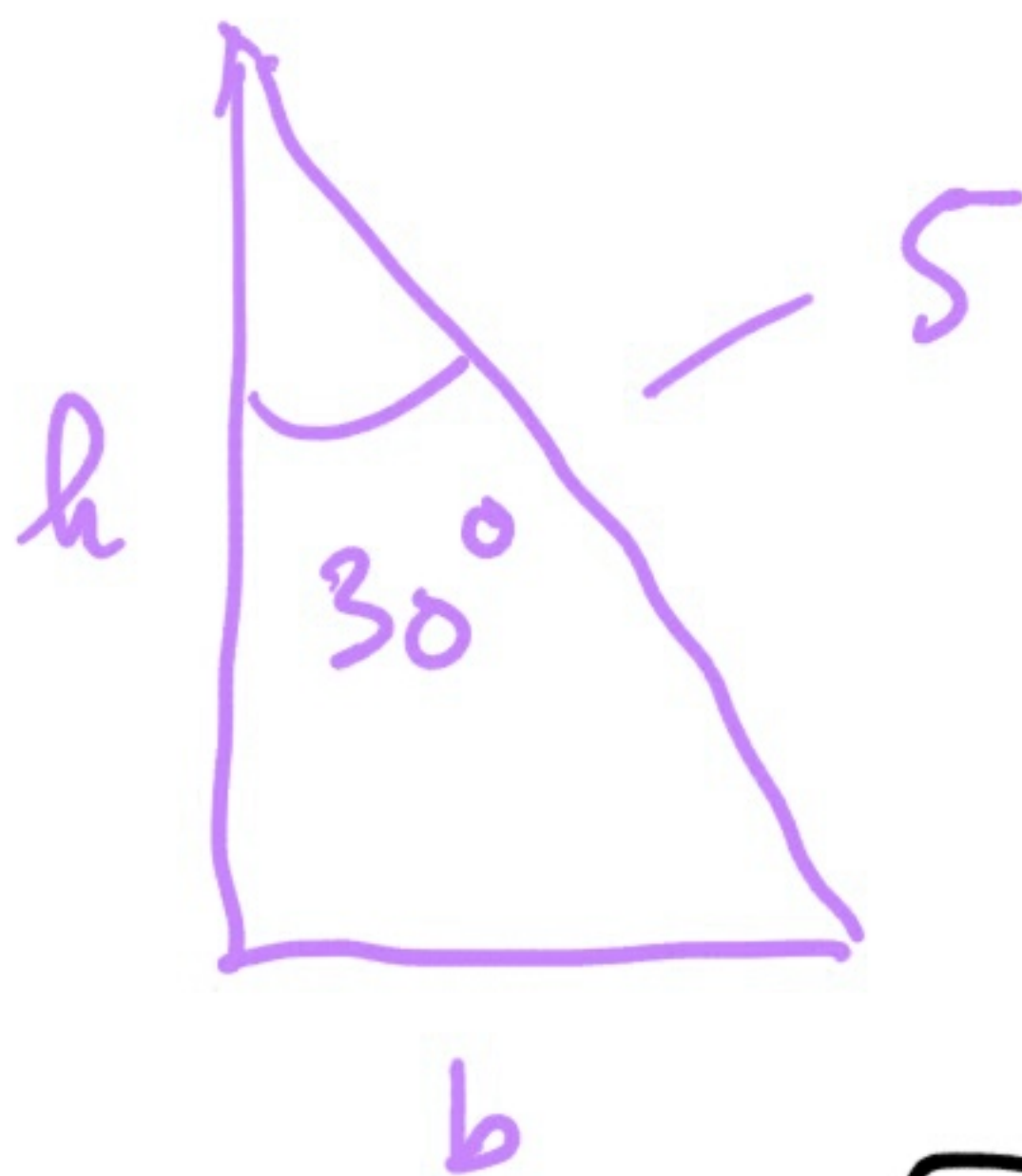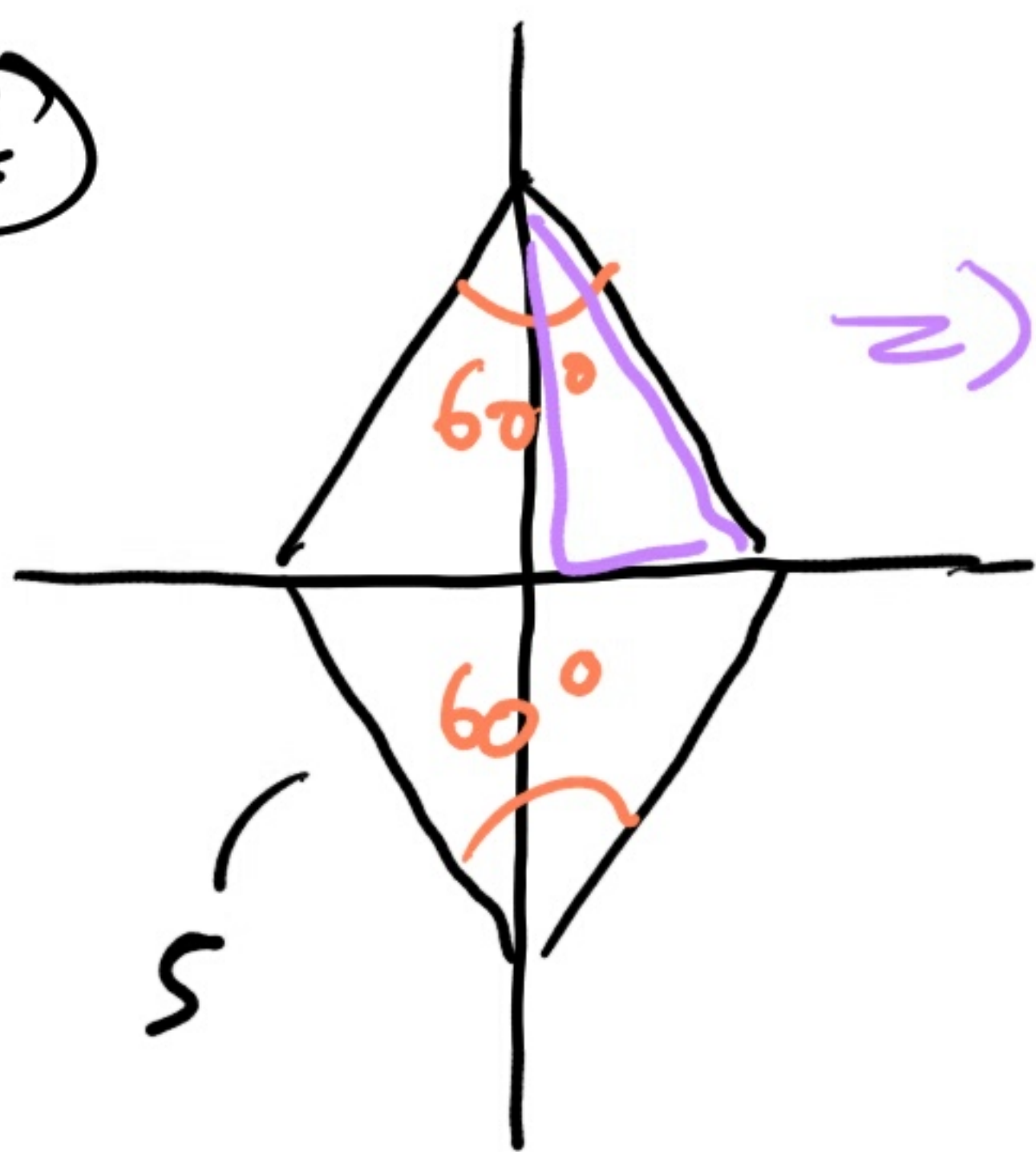
Snijpunt met x-as $\Rightarrow y = 0$!

$0 = -\dfrac{1}{e^3}x + \dfrac{2}{e^2} \Rightarrow \dfrac{1}{e^3}x = \dfrac{2}{e^2} \Rightarrow x = \dfrac{2e^3}{e^2}$

$\Rightarrow x = 2e \Rightarrow$ snijpunt $(2e, 0)$ Ⓓ

①

$h = 5 \cos 30° = 5 \cdot \dfrac{\sqrt{3}}{2}$

$b = 5 \sin 30° = 5 \cdot \dfrac{1}{2}$

$opp \; \Delta = \dfrac{1}{2} b \cdot h = \dfrac{1}{2} \cdot 5 \cdot \dfrac{1}{2} \cdot \dfrac{\sqrt{3}}{2}$

$\qquad\qquad = \dfrac{25}{8} \cdot \sqrt{3}$

$\Rightarrow \times 4 \rightarrow 4 \cdot \dfrac{25}{8} \cdot \sqrt{3} = \dfrac{25}{2} \cdot \sqrt{3}$

Ⓒ

⑧ $(x_1, x_2) \in \mathbb{R}$ oplossing van

$\quad x^2 - sx + p = 0$? s en p voldoen

$\quad$ en $x_1^2 + x_2^2 = 1$ $\quad$ aan ?

$$x = \frac{s \pm \sqrt{s^2 - 4 \cdot 1 \cdot p}}{2} = \frac{s}{2} \pm \frac{\sqrt{s^2 - 4p}}{2}$$

$$\left(\frac{s}{2} + \frac{\sqrt{\quad}}{2}\right)^2 + \left(\frac{s}{2} - \frac{\sqrt{\quad}}{2}\right)^2 = 1$$

$$\left[\frac{s^2}{4} + \frac{s^2 - 4p}{4} + \cancel{2\frac{s}{2}\frac{\sqrt{\quad}}{2}}\right] + \left[\frac{s^2}{4} + \frac{s^2 - 4p}{4} - \cancel{2\frac{s}{2}\frac{\sqrt{\quad}}{2}}\right]$$

$$\frac{s^2}{2} + \frac{s^2 - 4p}{2} = \frac{2s^2 - 4p}{2} = s^2 - 2p = 1$$

$\boxed{B}$

9

14% beuken T+

2% T+ → geen Pa   ? $P(T_+ | Pa)$

4% T- → wel Pa

test →	+	−	totaal
parasiet	12	4	16
geen parasiet	2	82	84
totaal	14	86	100

→ { met parasiet → totaal = 16
   { test positief → 12

⟹ $\dfrac{12}{16} = \dfrac{3}{4} = 0,75$ of 75%

Ⓐ

(10)

$^2\log x = a \iff 2^a = x$

$^2\log 2 = 1 \to 2^1 = 2$
$^2\log 4 = 2 \to 2^2 = 4$
$^2\log 8 = 3 \to 2^3 = 8$
$^2\log 16 = 4 \to 2^4 = 16$

\# bact $\times 2$ / 30 min $\to$ kamer

$\times 2$ / 8 uur $\to$ koelkast

$t_0 = 10000$ bact $\to$ 24 uur koelkast,
deana kamer

? hoeveel uur \# bact > 10^6

1) 24 uur koelkast $N = N_0 \cdot 2^x \searrow x =$ aantal keer $\times 2$!

$N = N_0 \cdot 2^3$

$= 10 \cdot 6^3 \cdot 2^3 = 80 \cdot 6^3$

2) $N = N_0 \cdot 2^x = 10^6$

$N = 80 \cdot 10^3 \cdot 2^x = 10^6$

$\Rightarrow {}^2\log(80 \cdot 6^3 \cdot 2^x) = {}^2\log(10^6)$

$\log(80) + \log(10^3) + \log(2^x) = 6 \log 10$

$\log 8 + \log 10 + 3 \log 10 + x \log 2 = 6 \log 10$

$\log 8 + x \log 2 = 2 \log 10$

$3 + x \cdot 1 = 2 \log 10$

$\Rightarrow x = -3 + 2 \log 10$

x = aantal keer $\times 2$ / 30 min
$\Rightarrow$ per uur
/2 !

$\Rightarrow$ aantal uur $-\dfrac{3}{2} + \log 10$

1) en 2)

$24 - \dfrac{3}{2} + \log 10 = \dfrac{48-3}{2} + \log 10$

$= \dfrac{45}{2} + \log 10 = \underline{22,5 + \log 10}$ Ⓒ

OF schatting $^2\log 10 \approx 3,3$

start : $80 \cdot 10^3$

$\qquad\qquad 160 \cdot 10^3$

$1u \rightarrow 320 \cdot 10^3$ $\qquad +24u$

$1u 30 \rightarrow 640 \cdot 10^3 \rightarrow$ $\qquad 25u\ 30$

$2u \rightarrow 1280 \cdot 10^3$ $\qquad\qquad 26u$

A $21 + 3,3 = 24,3$

B $21 + 2 \cdot 3,3 = 27,6$

C $22,5 + 3,3 = 25,8$ $\Longleftarrow$

D $22,5 + 2 \cdot 3,3 = 29,1$