

Quiz Optimisation

$$1) C(x) = \frac{5x-3}{3x^2+1}$$

$$C' = \frac{5(3x^2+1) - 6x(5x-3)}{(3x^2+1)^2}$$

$$C' = \frac{15x^2+5-30x^2+18x}{(3x^2+1)^2}$$

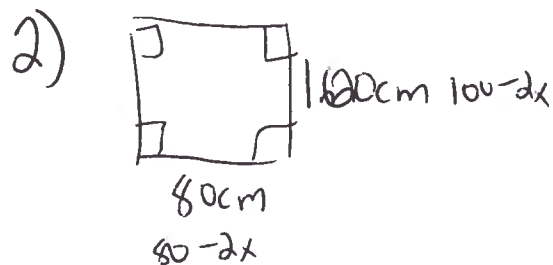
$$0 = \frac{-15x^2+18x+5}{(3x^2+1)^2}$$

$$x = 1,433$$

$$f = 1,433h$$

~~$$x = -0,233$$~~

6



$$V(x) = (x)(100-2x)(80-2x)$$

$$V(x) = (100x-2x^2)(80-2x)$$

$$V' = (100-4x)(80-2x) + -2(100x-2x^2)$$

$$V' = 8000 - 200x - 320x + 8x^2 - 200x + 4x^2$$

$$V' = 8000 - 720x + 12x^2$$

$$V' = 12x^2 - 720x + 8000$$

$$0 = 12x^2 - 720x + 8000$$

$$x = 14,725 \text{ cm}$$

~~$$x = 45,275$$~~

$$3, \quad x+y=135 \quad y=135-x \quad x=135-y$$

$$x^2 y^3 = P$$

$$(135-y)^2 y^3 = P$$

$$x^2 (135-x)^3 = P$$

$$-2(135-y)y^3 + 3y^2(135-y)^2 = P$$

$$y^2(135-y)[-2y + 3(135-y)] = P$$

$$2x(135-x)^3 + 3(135-x)^2(x^2) = P$$

$$(x)(135-x)^2 [2(135-x)(x) + 3x] = P [2(135-x) + 3x] = P$$

$$x(135-x)^2 = 0$$

$$2 + 3x = 0$$

$$270 - 2x + 3x = P$$

$$270 + x$$

$$x=0$$

$$x=135$$

$$x = -\frac{2}{3}$$

$$270 - 2x + 3x$$

$$y^2(135-y)[-2y + 405 - 3y] = P$$

$$y=0 \quad y=135 \quad (-5y + 405) = P$$

$$y = 81$$

$$x = 135 - 81$$

$$x = 54$$

$$P = 54^2 \cdot 81^3$$

$$\text{Product} = 1549681956$$

4. au moins 50 passengers \rightarrow 200 bananas (cost)

$$\text{Revenue} = (200 - 2x)(50 + x)$$

$$R = -2(50 + x) + 1(200 - 2x)$$

$$R = -100 - 2x + 200 - 2x$$

$$R = 100 - 4x$$

$$0 = 100 - 4x$$

$$x = 25$$

2

$$50 + 25 = 75 \text{ passengers}$$

5. $h(t) = -16t^2 + 96t + 112$
hauteur max?

$h \rightarrow$ en pieds
 $t \rightarrow$ en secondes

$$h(t) = -32t + 96$$

$$0 = -32t + 96$$

$$\frac{-96}{-32} = t$$
$$3 = t$$

2

$$h(3) = -16(3)^2 + 96(3) + 112$$

$$h(3) = 256 \text{ pieds}$$

6. $\leftarrow 140\text{cm} \rightarrow$

$$A = x^2$$

$$P = 4x$$

$$\pi r^2$$

$$2\pi r$$

$$A = x^2 + \pi r^2$$

$$\frac{140}{4} = \frac{4x}{4} + \frac{2\pi r}{4}$$

$$35 = x + \frac{\pi r}{2}$$

$$x = 35 - \frac{\pi r}{2}$$

$$A = \left(35 - \frac{\pi r}{2}\right)^2 + \pi r^2$$

$$A' = 2\left(35 - \frac{\pi r}{2}\right) \cdot \left(-\frac{\pi}{2}\right) + 2\pi r$$

$$A' = (70 - \pi r) \cdot \left(-\frac{\pi}{2}\right) + 2\pi r$$

$$0 = (70 - \pi r) \cdot \left(-\frac{\pi}{2}\right) + 4\pi r$$

$$0 = -70\frac{\pi}{2} + \frac{\pi^2}{2}r + 4\pi r$$

$$70\frac{\pi}{2} = \frac{\pi^2}{2}r + 4\pi r$$

$$\frac{70\frac{\pi}{2}}{\frac{\pi^2}{2} + 4\pi} = r \quad r = 9,802$$

$$a) \quad x = 35 - \frac{\pi \cdot 9,802}{2}$$

$$x = 19,603$$

$$P = 4 \times 19,603 = 78,412 \text{ cm} \quad \text{square}$$

$$C = 2\pi \cdot 9,802 = 61,588 \text{ cm} \quad \text{circle}$$

$$b) \quad A_0 = \pi r^2 \quad 2\pi r = 140$$

$$r = 22,28$$

$$A = \pi \cdot 22,28^2$$

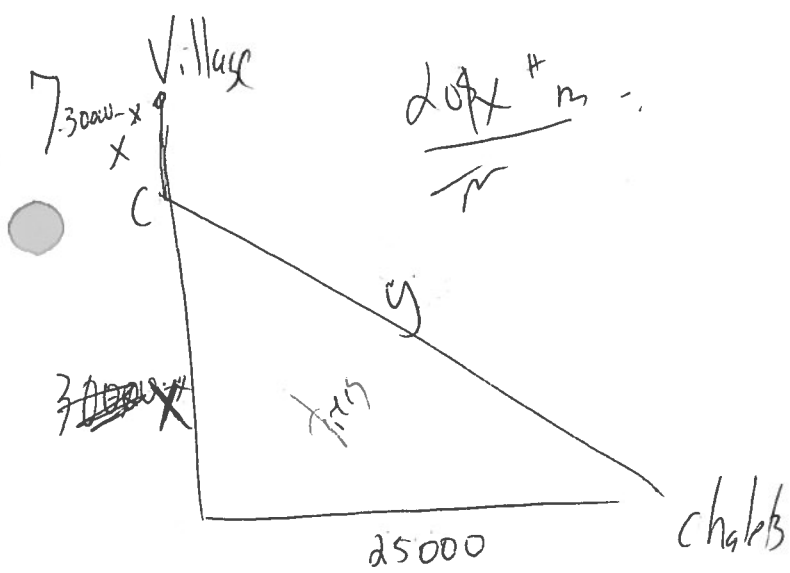
$$A = 1559,762 \text{ cm}^2$$

$$c) \quad 140 = 4x$$

$$x = 35 \text{ cm}$$

$$A = 35^2$$

$$A_0 = 1225 \text{ cm}^2$$



$$y^2 = x^2 + 25000^2$$

$$y = \sqrt{x^2 + 25000^2}$$

$$y' = \frac{1}{2} \sqrt{x^2 + 25000^2}^{-1/2} (2x)$$

$$y' = \frac{x}{\sqrt{x^2 + 25000^2}}$$

$$\sqrt{x^2 + 25000^2} = y$$

$$y = \sqrt{18750^2 + 25000^2}$$

$$y = 31250$$

~~$20 \times y + 12(30000 - x) = \text{cost total}$~~

$$20y + 12(30000 - x) = C$$

$$20(\sqrt{x^2 + 25000^2}) + 12(30000 - x) = C$$

$$20(x^2 + 25000^2)^{1/2} + 360000 - 12x = C$$

$$10(x^2 + 25000^2)^{-1/2} \cdot 2x - 12 = C'$$

$$\frac{20x}{(x^2 + 25000^2)^{1/2}} - 12 = C'$$

$$X = 18750 \text{ metres}$$

a) distance $C \rightarrow$ village

11250m

$$b) = 20(31250) + 12(11250) = C$$

$$C = 760000 \text{ \$}$$

30000
-18750
11250m

31250

x

$$20x - 12(x^2 + 25000^2)^{1/2} = 0$$

$$20x = 12\sqrt{x^2 + 25000^2}$$

$$400x^2 = 144(x^2 + 25000^2)$$

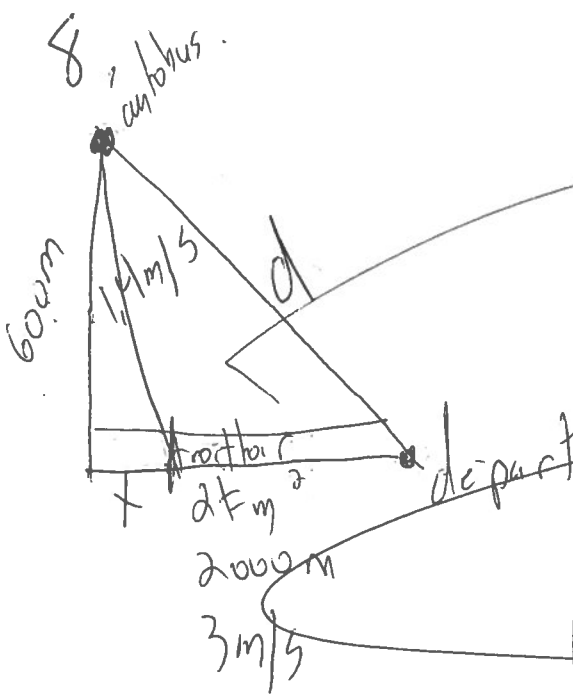
$$400x^2 = 144x^2 + 36000000$$

$$256x^2 = 36000000$$

$$x^2 = 14062500$$

$$x = 118585$$

4



$$t = \frac{d}{v}$$

$$360000 = \frac{9x^2}{1.96} - x^2$$

$$360000 = 3.592x^2$$

$$x = 316.580 \text{ m}$$

$$b) \quad t = \frac{2000 \text{ m}}{3 \text{ m/s}} + \frac{600 \text{ m}}{1.4}$$

$$t = 1095,238 \text{ sec} = 18,254 \text{ min}$$

$$c) \quad d = \sqrt{600^2 + 2000^2} = 2088,061 \text{ m}$$

$$d^2 = (1.4 \cdot t)^2 + (3 \cdot t)^2$$

$$t = \frac{d}{v} \quad t = \frac{2088,061 \text{ m}}{1.4 \text{ m/s}} = 1491,472 \text{ s}$$

$$d) \quad t = \frac{d}{v}$$

$$d_2 = \sqrt{600^2 + x^2} \rightarrow d = \sqrt{600^2 + 123955^2}$$

$$d = 612,670 \text{ m}$$

$$t = \frac{2000 - 123955}{3} = \frac{76045}{3} = 25348,33 \text{ s}$$

$$t = \frac{2000 - x}{3} + \frac{\sqrt{600^2 + x^2}}{1.4}$$

$$t = -\frac{1}{3} + \frac{x}{1.4 \sqrt{360000 + x^2}}$$

$$t = \frac{2000 - x}{3} + \frac{(600^2 + x^2)^{1/2}}{1.4}$$

$$t = -1.4(360000 + x^2)^{1/2} + 3x$$

$$t = \frac{2000}{3} - \frac{x}{3} + \frac{(360000 + x^2)^{1/2}}{1.4}$$

$$0 = 3x - 1.4(360000 + x^2)^{1/2}$$

$$t = \frac{-1}{3} + \frac{1}{2 \cdot 1.4} (360000 + x^2)^{1/2} \cdot 2x$$

$$1.4(360000 + x^2)^{1/2} = 3x$$

$$\sqrt{360000 + x^2} = \left(\frac{3x}{1.4}\right)^2$$

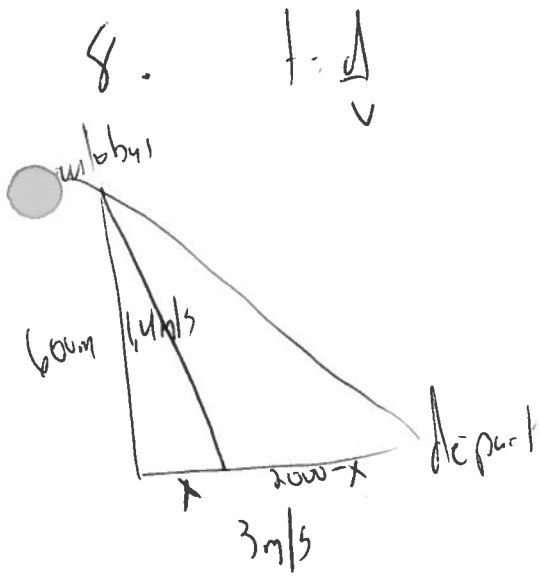
$$360000 + x^2 = \frac{9x^2}{1.96}$$

$$360000 = \frac{8x^2}{1.96}$$

$$x = 316.580 \text{ m}$$

$$\sqrt{5369957} = 5$$

$$\sqrt{123955} = x$$



b) $t = \frac{2000\text{m}}{3\text{m/s}} + \frac{600\text{m}}{1,4\text{m/s}} \quad t = 1095,238\text{sec}$
 $18,254\text{min.}$ ✓

c) $\sqrt{600^2 + 2000^2} = 2088,061\text{m}$

$t = \frac{2088,061\text{m}}{1,4\text{m/s}} \quad t = 1491,472\text{sec}$ ✓
 $= 24,858\text{min.}$

d) $d = \sqrt{600^2 + x^2}$

$t = \frac{2000 - x}{3} + \frac{\sqrt{600^2 + x^2}}{1,4}$

$t = \frac{2000 - x}{3} + \frac{(600^2 + x^2)^{1/2}}{1,4}$

$t' = -\frac{1}{3} + \frac{1}{2 \cdot 1,4} (600^2 + x^2)^{-1/2} \cdot 2x$

$t' = -\frac{1}{3} + \frac{x}{1,4(360000 + x^2)^{1/2}}$

$\frac{1}{3} = \frac{x}{1,4\sqrt{360000 + x^2}}$

$(1,4\sqrt{360000 + x^2})^2 = (3x)^2$ ✓

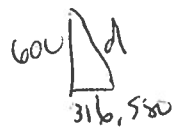
$1,96(360000 + x^2) = 9x^2$

$360000 = \frac{9x^2}{1,96} - x^2$

$360000 = 3,542x^2$

$x = 316,580\text{m}$

$2000 - x$
 $2000 - 316,580 = 1683,42\text{m}$



$\sqrt{600^2 + 316,580^2} = d$
 $d = 678,397\text{m}$

$t = \frac{1683,42\text{m}}{3\text{m/s}} + \frac{678,397\text{m}}{1,4\text{m/s}}$

$t = 1045,709\text{sec}$ ✓

$t = 17,428\text{min.}$

→ trop de temps pour prendre l'autobus.

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