$y = -16t^2 + 50t + 5$

1. $\frac{dy}{dt} = -32t + 50$

$0 = -32t + 50$

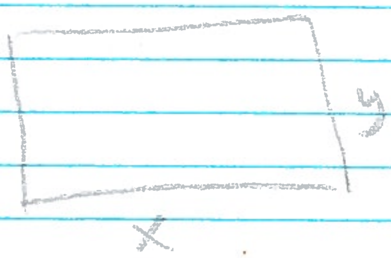
$\frac{-50}{-32} = t$

$t = 1{,}5625$ secondes

$y = -16(1{,}5625)^2 + 50(1{,}5625) + 5$

$\boxed{y = 44{,}0625 \text{ pi}}$

	$-\infty$	1,5625	∞
$\frac{dy}{dt}$	+	0	−
y	↗	max	↘

2. 

plus grand rectangle alors maximum

$P = 36\text{ m} = 2x + 2y$

$36 = 2x + 2y$

$18 = x + y$

$18 - x = y$

$A = x \cdot y$

$A = x(18 - x)$

$A = 18x - x^2$

$\frac{dA}{dt} = 18 - 2x$

$0 = 18 - 2x$

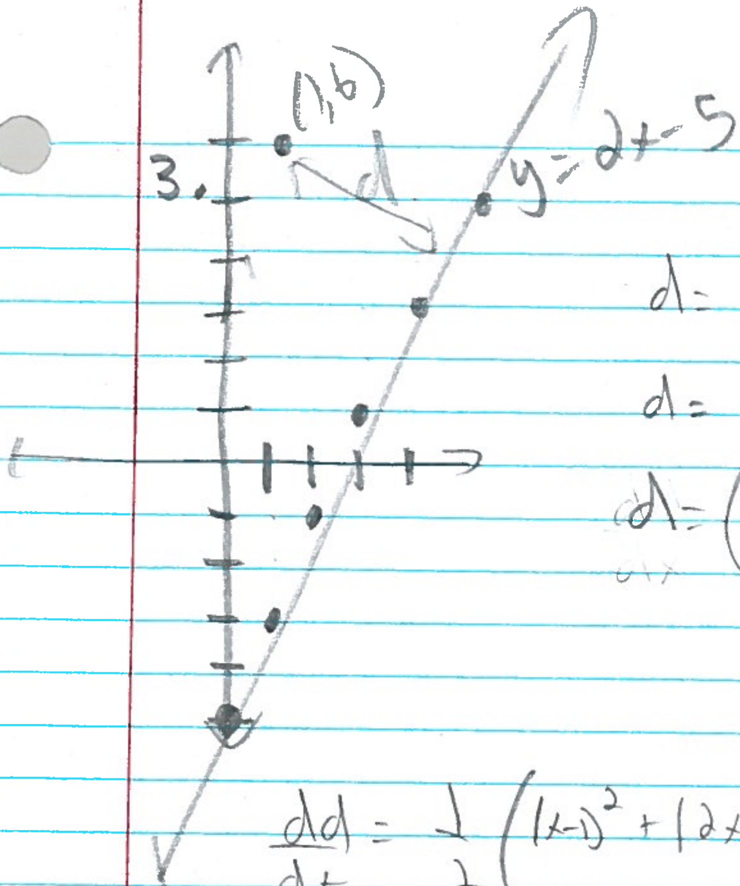
$x = 9$

$y = 9$

$\boxed{\text{Dimensions } 9\text{m} \times 9\text{m}}$

	$-\infty$	9	∞
dA/dt	+	0	−
A	↗	max.	↘

3.



$$d = \sqrt{(x_2-x_1)^2 + (\overset{y=2x-5}{y_2}-y_1)^2}$$

$$d = \sqrt{(x-1)^2 + ((2x-5)-6)^2}$$

$$d = \sqrt{(x-1)^2 + (2x-11)^2}$$

$$d = \left((x-1)^2 + (2x-11)^2\right)^{\frac{1}{2}}$$

$$\frac{dd}{dx} = \frac{1}{2}\left((x-1)^2 + (2x-11)^2\right)^{-\frac{1}{2}} \cdot \left(2(x-1)\cdot 1 + 2(2x-11)\cdot 2\right)$$

$$\frac{dd}{dx} = \frac{2(x-1)+4(2x-11)}{2\sqrt{(x-1)^2+(2x-11)^2}} = \frac{2x-2+8x-44}{2\sqrt{(x-1)^2+(2x-11)^2}}$$

$$0 = 10x - 46$$

$$46 = 10x$$
$$4{,}6 = x$$

$$y = 2(4{,}6) - 5$$
$$y = 4{,}2$$

$$d = \sqrt{(4{,}6-1)^2 + (4{,}2-6)^2}$$

$$d = \sqrt{3{,}6^2 + (-1{,}8)^2}$$

$$d = \sqrt{16{,}2}$$

$$\boxed{d = 4{,}025}$$

4. $x+y=20 \qquad y=20-x$

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

$x^3 \cdot (20-x)^2 = P$

$\frac{dP}{dx} = 3x^2(20-x)^2 + 2(20-x) \cdot -1 \cdot x^3$

$= 3x^2(20-x)^2 - 2x^3(20-x)$

$dP/dx = x^2(20-x)[3(20-x) - 2x]$

$0 = x^2(20-x)[60-3x-2x]$

$0 = x^2(20-x)(60-5x)$

$\cancel{x=0} \qquad \cancel{x=20} \qquad \boxed{x=12}$

$12+y=20$

$y=8$

	$-\infty$		0		12		20		∞
$\frac{dP}{dx}$		+	0	+	0	+	0	+	
P					max				

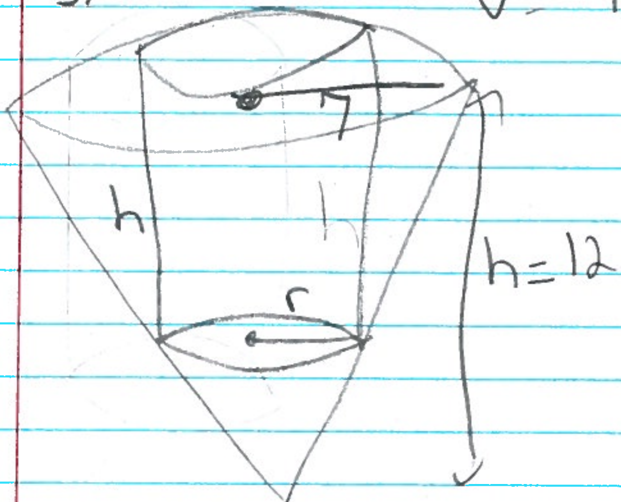
5.

cylindre

$V = \pi r^2 h$

cône

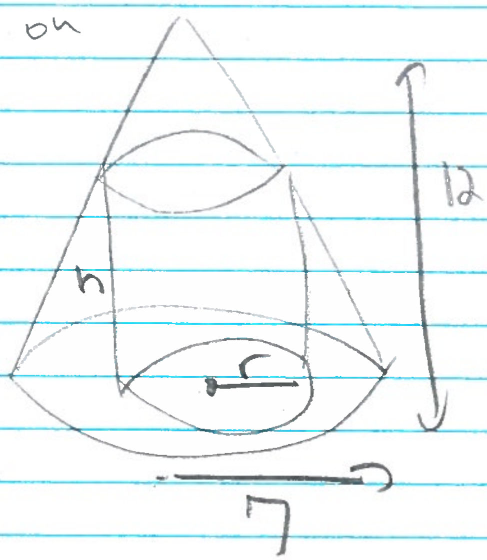
$V = \dfrac{\pi r^2 h}{3}$

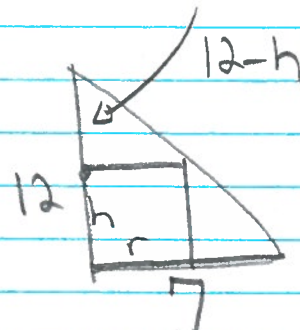


$V_{cone} = \dfrac{\pi \cdot 7^2 \cdot 12}{3}$

$= 196\pi$

ou





h : hauteur du cylindre
r : rayon du cylindre
V : volume du cylindre

rapport

$\dfrac{12-h}{r} = \dfrac{12}{7}$

$12-h = \dfrac{12}{7} r$

$12 - \dfrac{12r}{7} = h$

Variable à maximiser est V.

$V = \pi r^2 h$

$V = \pi r^2 \left(12 - \dfrac{12r}{7}\right) = 12\pi r^2 - \dfrac{12\pi r^3}{7}$

$r = 0$

$\dfrac{dV}{dr} = 24\pi r - \dfrac{36\pi r^2}{7}$

$r = \dfrac{14}{3}$

$\dfrac{dV}{dr} = 12\pi r \left(2 - \dfrac{3r}{7}\right)$

$0 = 12\pi r \left(2 - \dfrac{3r}{7}\right)$

#5 cont.

r	$-\infty$		0		$\frac{14}{3}$		∞
$\frac{dV}{dr}$		$+$	0	$+$	0	$-$	
V		$\nearrow$		$\nearrow$	max	$\searrow$	

Attention!

Dans le contexte on ne peut pas avoir un rayon négative!

Alors il y a un domaine restraint

$$h = 12 - \frac{12r}{7}$$

$$h = 12 - \frac{12 \cdot \frac{14}{3}}{7}$$

$$h = \frac{252}{21} - \frac{168}{21}$$

$$h = \frac{84}{21}$$

$$\boxed{h = 4}$$