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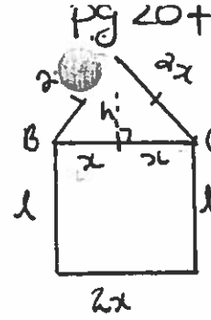
10.



Find h in terms of x

$h^2 = 4x^2 - x^2$

$h^2 = 3x^2$

$h = \sqrt{3}x$

Find l in terms of x

6m of framing

$2l + 8x = 6$

$2l = 6 - 8x$

$l = 3 - 4x$

Maximize area A, in m^2

$A = \frac{1}{2}bh + lw$

$A = \frac{1}{2}(2x)(\sqrt{3}x) + (2x)(3-4x)$

$A = \sqrt{3}x^2 + 6x - 8x^2$

$\frac{dA}{dx} = ?$

For max. area

$\frac{dA}{dx} = 0$

↓

Note: $0 < x < \frac{1}{2}$

For restrictions

$2x < 1$

$x < \frac{1}{2}$

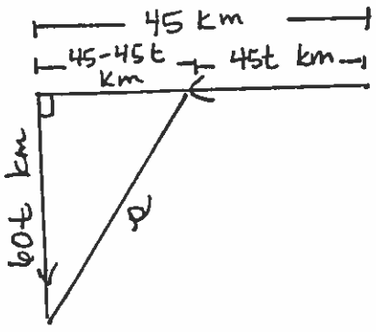
$l + h < 3$

$3 - 4x + \sqrt{3}x < 3$

$-4x + \sqrt{3}x < 0$

$x > 0$

11.



Let t (h) represent the time the trains have been travelling for since 10:00

minimize the distance between the trains, d, in km

$d^2 = (45-45t)^2 + (60t)^2$

$d^2 =$

$2d\frac{dd}{dt} = ?$

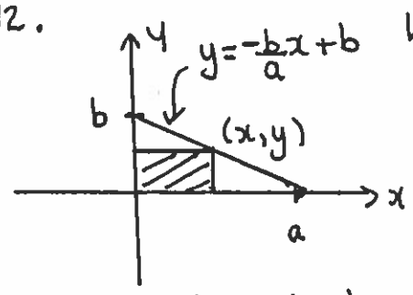
For min. distance

$\frac{dd}{dt} = 0$

↓

$0 =$

12.



$m = -\frac{b}{a}$, $b = b$

$y = -\frac{b}{a}x + b$

let the legs of the triangle measure a units & b units

maximize area, A in $units^2$

$A = lw$

$A = x \cdot y$

$A = x\left(-\frac{b}{a}x + b\right)$

$A = -\frac{b}{a}x^2 + bx$

$\frac{dA}{dx} = ?$

For area

$\frac{dA}{dx} = 0$

↓

13.

$V = k$ $units^3$

Find h in terms of r

$\pi r^2 h = k$

$h = \frac{k}{\pi r^2}$

minimize the surface area, S.A in $units^2$

$S.A = A_{top\ \&\ bottom} + A_{sides}$

$S.A = 2\pi r^2 + 2\pi r h$

$S.A = 2\pi r^2 + 2\pi r \cdot \frac{k}{\pi r^2}$

$S.A = 2\pi r^2 + 2kr^{-1}$

$\frac{d.SA}{dr} = ?$

For min S.A

$\frac{dSA}{dr} = 0$

↓

$r^3 = ?$

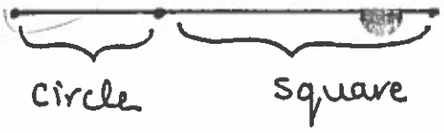
$\frac{h}{d}$

$= \frac{h}{2r}$

$= \frac{\frac{k}{\pi r^2}}{2r}$

$= \frac{k}{2\pi r^3}$ ←

11.



Let $4x$ cm be the perimeter of the circle.

$2\pi r = 4x$

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

Let $100-4x$ cm be the perimeter of the square

$l = \frac{100-4x}{4}$

$l = 25-x$

Minimize: minimum of a circle & square, A in cm^2.

$A = \pi r^2 + lw$

$A = \pi\left(\frac{2}{\pi}x\right)^2 + (25-x)^2$

$A = \frac{4}{\pi}x^2 + 625 - 50x + x^2$

$\frac{dA}{dx} = ?$

For max/min area

$\frac{dA}{dx} = 0$

Note: Restrictions

If 100 cm is formed into a circle only

$4x = 100$

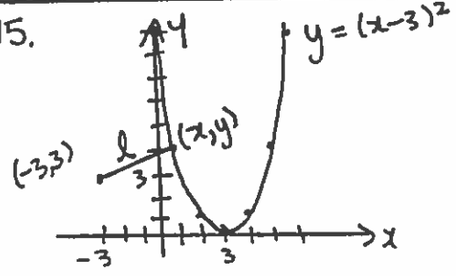
$x = 25$

$0 \le x \le 25$

If 100cm is formed into square only $x = 0$

x	A
0	
?	
25	

15.



Minimize the length, l, in units.

$l = \sqrt{(x+3)^2+(y-3)^2}$

$l^2 = (x+3)^2+(y-3)^2$

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

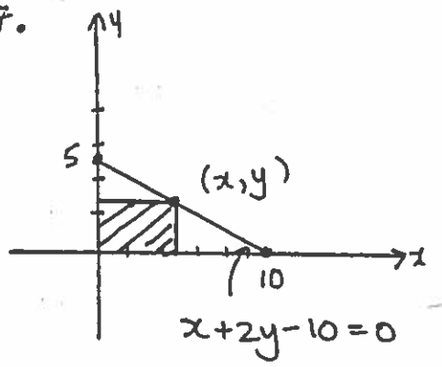
$l^2 = x^2+6x+9+(x^2-6x+6)^2$

$2l\cdot\frac{dl}{dx} = 2x+6+2(x^2-6x+6)(2x-6)$

For min. length

$\frac{dl}{dx} = 0$

7.



$x+2y-10=0$

$x = 10-2y$

Maximize the Area, A in units^2

$A = lw$

$A = xy$

$A = (10-2y)(y)$

$A = -2y^2+10y$

$\frac{dA}{dy} = ?$

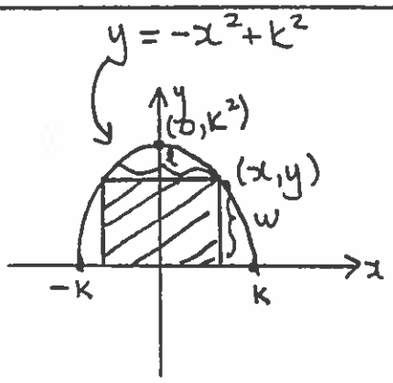
For max. area

$\frac{dA}{dy} = 0$

Note: $0 \le y \le 5$

y	A
0	
?	
5	

3.



Maximize the Area, A in units^2

$A = lw$

$A = 2x\cdot y$

$A = 2x(-x^2+k^2)$

$A = -2x^3+2xk^2$

$A = -2x^3+2k^2x$

$\frac{dA}{dx} = ?$

For max. area

$\frac{dA}{dx} = 0$

Note: $0 \le x \le k$

x	A
0	
?	
k	