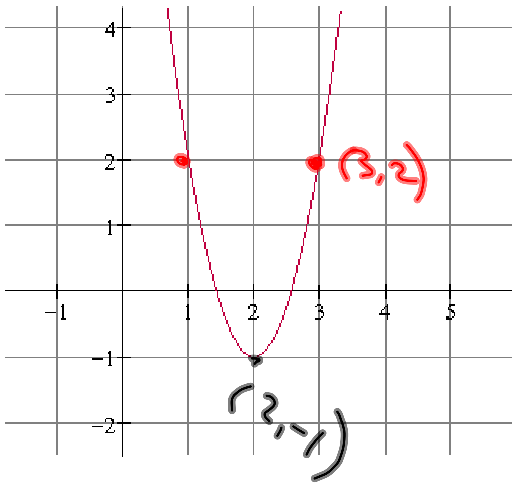
Warm Up

$y = 3x^2 - 12x + 11$

Determine the equation of this parabola in general form.



$y = a(x-h)^2 + k$

$y = a(x-2)^2 - 1$

$2 = a(3-2)^2 - 1$

$3 = a(1)$

$3 = a$

$y = 3(x-2)^2 - 1$

$y = 3(x^2 - 4x + 4) - 1$

$y = 3x^2 - 12x + 12 - 1$

$y = 3x^2 - 12x + 11$

Quiz:

Quadratic Functions:

$\Rightarrow$ 3 forms:

$\Rightarrow$ Mapping Notation

$\Rightarrow$ * Completing Square: Gen $\rightarrow$ Std.

$\Rightarrow$ Identifying Properties $\Rightarrow$ Sketch

$\Rightarrow$ Find equation of Parabola

$\Rightarrow$ Max./Min. (y-Value @ vertex)

Maximum and Miminum Values: Review

$y = x^2 - x + 7$

The number of bacteria in a refrigerated food is given by $N(T) = 20T^2 - 20T + 120$, for $-2 \le T \le 14$ and where T is the temperature of the food in Celsius. At what temperature will the number of bacteria be minimal?

$+5$

$N(T) = 20(T^2 - 1T + \frac{1}{4}) + 120 - 5$

$N(T) = 20(T - \frac{1}{2})^2 + 115$

$V(\frac{1}{2}, 115)$ $\frac{1}{2}\ °C$

$\longrightarrow (T, N)$

The height, h, in feet of an object above the ground is given by $h = -16t^2 + 64t + 190$, $t \ge 0$ where t is the time in seconds. Find the time it takes the object to strike the ground and find the maximum height of the object.

-64

$h = -16(t^2 - 4t + \underline{4}) + 190 + 64$

$h = -16(t-2)^2 + 254 \Rightarrow$

$V(2, 254)$

(t, h)

Max height = 254 feet

$h = 0$ (ground)

$0 = -16(t-2)^2 + 254$

$\frac{-254}{-16} = \frac{-16(t-2)^2}{-16}$

$\sqrt{15.875} = \sqrt{(t-2)^2}$

$\pm 3.98 = t - 2$

$2 \pm 3.98 = t$

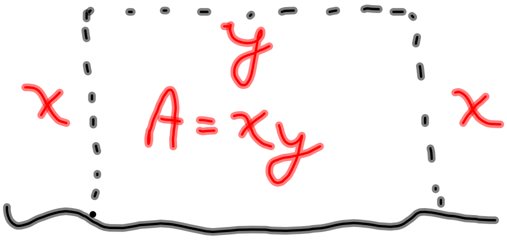
$t = 2 + 3.98$ OR $t = 2 - 3.98$

$t = 5.98$ sec

$\cancel{t = -1.98}$

EXAMPLE #2

A lifeguard has 600 m of buoys to rope off a rectangular swimming area. What dimensions will give a maximum swimming area?



$$2x + y = 600$$

$$y = 600 - 2x$$

$$A = xy$$

$$A = x(600 - 2x)$$

$$A = -2x^2 + 600x$$

$$A = -2(x^2 - 300x + 22500) + 45000$$

$$A = -2(x - 150)^2 + 45000$$

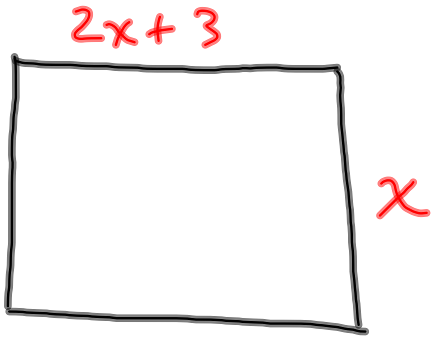
$$V(150, 45000)$$

$$(x, A)$$

$$y = 600 - 2(150)$$
$$= 300$$

150 m by 300 m

The length of a rectangle is three more than twice the width. ~~Determine the dimensions that will give a total area of 27 m^2~~. What is the minimum area that this rectangle can have?



$$A = x(2x+3)$$

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

$$\frac{1}{2} \times \frac{3}{2} = \frac{3}{4}$$

$$A = 2\left(x^2 + \frac{3}{2}x + \frac{9}{16}\right) - \frac{9}{8}$$

$$\frac{9}{\cancel{16}_{8}} \times \frac{\cancel{2}^{1}}{1} = \frac{9}{8}$$

$$A = 2\left(x + \frac{3}{4}\right)^2 - \frac{9}{8}$$

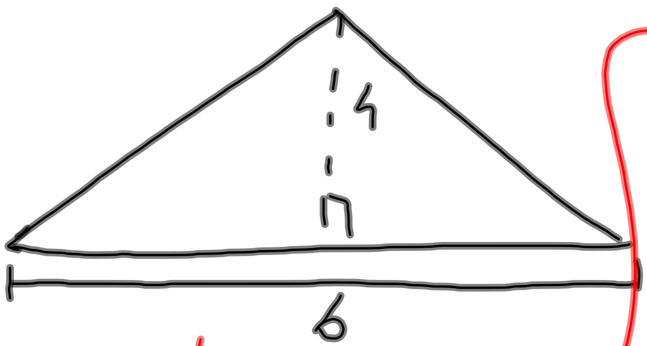
$$V\left(-\frac{3}{4}, -\frac{9}{8}\right)$$

$$(x, A)$$

$\therefore$ Min. Area = $\underline{0 \, m^2}$

MORE EXAMPLES...

Determine the maximum area for a triangle in which the sum of the base and the height is 360 m.



$b+h=360$

$b=360-h$

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

$\frac{1}{2}h(360-h)$

$A=\frac{1}{2}(360-h)h$

$A=-\frac{1}{2}h^2+180h$

$A=-\frac{1}{2}(h^2-360h+\quad)$

Attachments

worksheet with equations.doc