

Find vertex, axis of symmetry, roots, determine whether the graph has a min/max, and draw the graph for the quadratic equations below.

1.  $y = -x^2 - 4x + 12$

AOS:  $x = -2$

Vertex:  $(-2, 16)$

Max/Min: Vertex is a Maximum

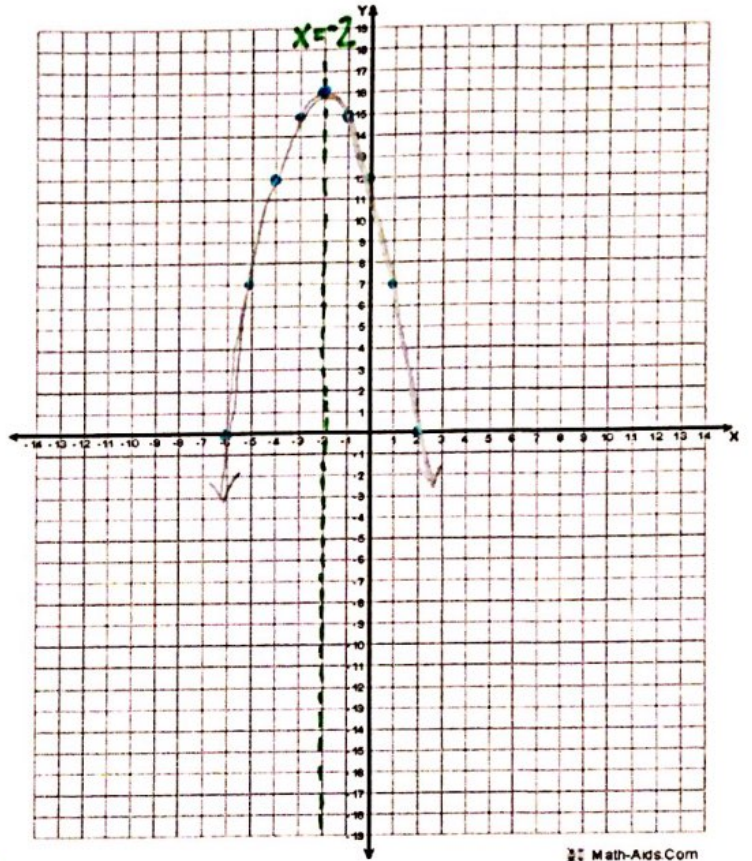
y-intercept:  $(0, 12)$

solutions/roots:  $(2, 0)$  &  $(-6, 0)$

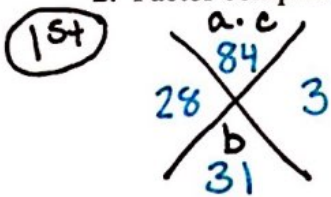
"y" is increasing  
increasing interval:  $(-\infty, -2)$   
When x is  $\rightarrow$

"y" is decreasing  
decreasing interval:  $(-2, +\infty)$   
When x is  $\rightarrow$

domain:  $(-\infty, +\infty)$  / range:  $(-\infty, 16]$



2. Factor completely:  $7x^2 + 31x + 12$



Box OR

	$7x$	$3$
$x$	$7x^2$	$3x$
$4$	$28x$	$12$

$(7x + 3)(x + 4)$

Grouping

$(7x^2 + 28x) + (3x + 12)$   
 $7x(x + 4) + 3(x + 4)$

3. Jon throws a baseball. The height of the function can be determined by  $H(t) = -16t^2 + 40t + 5$

a. What is the maximum height of the ball? 30 ft.

b. When will the ball be at its maximum height? 1.25 sec (1 1/4 sec.)

4. Suppose you throw a ball into the air. The ball is 6 feet high when it leaves your hand.

The equation  $-16t^2 + 20t = -6$  models the path of the ball. How many seconds is the ball in the air?

$-16t^2 + 20t + 6 = 0$

1 1/2 seconds

5. An electronics company has a new line of portable radios with CD players. Their research suggests that the daily sales  $s$  for the new product can be modeled by  $s = -p^2 + 120p + 1400$  - where  $p$  is the price of each unit.

a. What are the maximum daily sales?

find the vertex (maximum y value/sales) = 5000 units

b. What price will result in that maximum? \$60.00  
 ↑ x-value of vertex

6. The product of two consecutive numbers is 5 less than 7 times the smaller number. Find each number.

1st # =  $x$

$$x(x+1) = 7x - 5$$

2nd # =  $x+1$

$$x^2 + x = 7x - 5$$

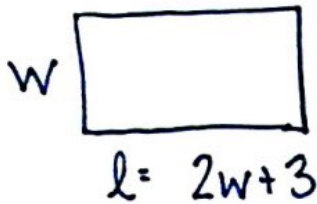
$$x^2 - 6x = -5$$

$$x^2 - 6x + 5 = 0 \Rightarrow (x-5)(x-1) = 0$$

$$\begin{array}{c} 5 \\ -5 \quad -1 \\ -6 \end{array}$$

There are 2 sets of numbers :  
 $x-5=0 \Rightarrow x=5 \Rightarrow \{5,6\}$   
 $x-1=0 \Rightarrow x=1 \Rightarrow \{1,2\}$

7. You are building a rectangular swimming pool. You want the area of the bottom of the pool to be 90 ft<sup>2</sup>. You want the length of the pool to be 3 feet longer than twice the width. What are the dimensions of the pool?



$$w \cdot l = A$$

$$w(2w+3) = 90$$

$$2w^2 + 3w = 90$$

$$2w^2 + 3w - 90 = 0$$

$(2w+15)(w-6) = 0$

$2w+15=0 \Rightarrow 2w=-15 \Rightarrow w \neq -\frac{15}{2}$

$w-6=0 \Rightarrow w=6$

$l=15$

①  $\begin{array}{c} -180 \\ 15 \quad -12 \\ 2 \end{array}$  → ② Grouping

$(2w^2 - 12w)(15w - 90)$   
 $2w(w-6) \cdot 15(w-6)$

8. You are trying to dunk a basketball. You need to jump 2.5 ft in the air to dunk the ball. The height that your feet are above the ground is given by the function  $h = -16t^2 + 12t$ . Will you be able to dunk the basketball?

No :  
 You are not going to make it :  
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