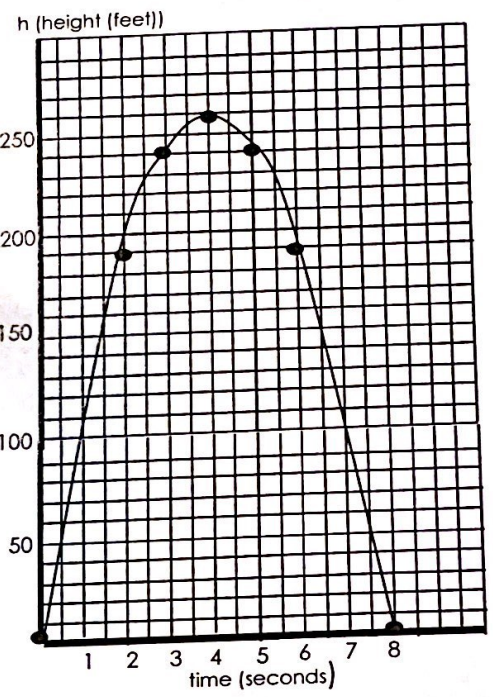## APPLICATIONS WITH PARABOLIC FUNCTIONS (DAY 7)

EX. 1 Using the graph at the right, It shows the **height h** in feet of a small rocket **t seconds** after it is launched. The path of the rocket is given by the equation:
$h = -16t^2 + 128t$.

1. How long is the rocket in the air? _____

2. What is the greatest height the rocket reaches? _____

3. About how high is the rocket after 1 second? _____

4. After 2 seconds,
   about how high is the rocket? _____

   is the rocket going up or going down? _____

5. After 6 seconds,
   about how high is the rocket? _____

   is the rocket going up or going down? _____

h (height (feet))

6. Do you think the rocket is traveling faster from 0 to 1 second or from 3 to 4 seconds? Explain your answer.

7. Using the equation, find the **exact** value of the height of the rocket at 2 seconds.

8. What is the domain of the graph?

9. What is the range of the graph?

10. Express the interval over which the graph is increasing.

11. Express the interval over which the graph is decreasing.

12

EX2: A ball is thrown in the air. The path of the ball is represented by the equation $h = -t^2 + 8t$. Graph the equation over the interval $0 \le t \le 8$ on the accompanying grid.

height (meters)

time (seconds)
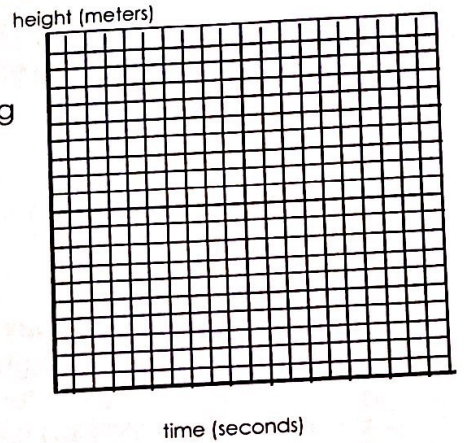
a) What is the maximum height of the ball?_____

b) What is the amount of time that the ball is above 7 meters? _____

EX3: A swim team member performs a dive from a 14-foot high springboard. The parabola below shows the path of her dive.
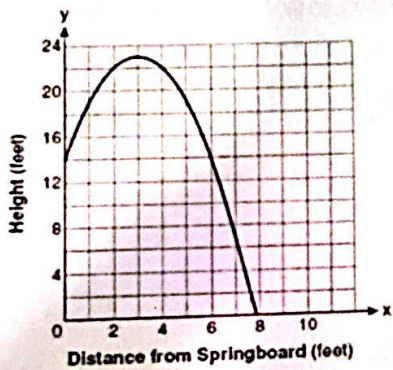
a) What is the axis of symmetry? _____

b) Find f(6) _____

EX4: Consider the graph of the equation $y = ax^2 + bx + c$, when $a \ne 0$. If a is multiplied by 3, what is true of the graph of the resulting parabola?

1) The vertex is 3 units above the vertex of the original parabola.
2) The new parabola is 3 units to the right of the original parabola
3) The new parabola is wider than the original parabola.
4) The new parabola is narrower than the original parabola.

EX5: Melissa graphed the equation $y = x^2$ and Dave graphed the equation $y = -3x^2$ on the same coordinate grid. What is the relationship between the graphs that Melissa and Dave drew?

EX6: The graph of a parabola is represented by the equation $y = ax^2$ where a is a positive integer. What happens to the new parabola if a is multiplied by 2? What if multiplied by $\frac{1}{2}$?

13

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Warm-Up: If 5 is a root of $x^2 - 3x + k = 0$, find k.

What is the other root?

Procedure for Word Problems
- Highlight given functions in the word problems
- Identify variables in the problem/function and highlight what they represent
- READ question carefully to determine WHAT variable needs to be solved for

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1. After t seconds, a ball tossed in the air from the ground level reaches a height of h feet given by the function $h(t) = 144t - 16t^2$.

   a. What is the height of the ball after 3 seconds?

   b. What is the maximum height the ball will reach?

   c. After how many seconds will the ball hit the ground before rebound?

14

2. A rocket carrying fireworks is launched from a hill 80 feet above a lake. The rocket will fall into the lake after exploding at its maximum height. The rocket's height above the surface of the lake is given by the function $h(t) = -16t^2 + 64t + 80$.

a. What is the height of the rocket after 1.5 seconds?

b. What is the maximum height reached by the rocket?

c. After how many seconds after it is launched will the rocket hit the lake?

3. A rock is thrown from the top of a tall building. The distance, in feet, between the rock and the ground t seconds after it is thrown is given by $d(t) = -16t^2 - 4t + 382$. How long after the rock is thrown is it 370 feet from the ground?