

**QUADRATIC FUNCTIONS (Extra Practice):**

1. Determine the domain and range of the following functions.

a)  $f(x) = -3(x - 2)^2 + 5$

b)  $f(x) = 2x^2 + 4x - 9$

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2. Determine the zeros of the function  $f(x) = -3(x + 1)^2 + 12$ . \_\_\_\_\_

3. Determine the y-intercept of  $f(x) = -\frac{1}{2}(x + 4)^2 + 9$ . \_\_\_\_\_

4. Determine over what interval the function  $f(x) = 2x^2 - 5x - 3$  is positive. \_\_\_\_\_

5. Determine over what interval the function  $f(x) = 3x^2 + 6x - 5$  is increasing. \_\_\_\_\_

6. Determine the extrema of the function  $f(x) = -2x^2 + 12x - 7$ . \_\_\_\_\_

7. What is the axis of symmetry of the function  $f(x) = -\frac{1}{4}x^2 + 3x + 1$ ? \_\_\_\_\_

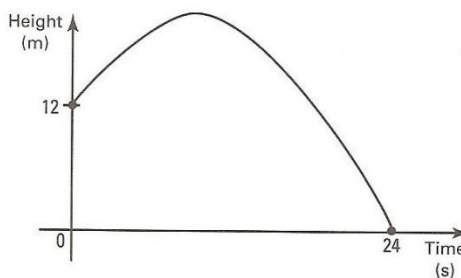
8. Determine the values of  $x$  for which the function  $f(x) = -3(x + 4)^2 + 5$  is equal to  $-7$ . \_\_\_\_\_

9. Find the rule of the quadratic function represented by a parabola with a vertex at  $V(-1, 5)$  and passing through the point  $P(1, 3)$ . \_\_\_\_\_

10. A stone is thrown upward from the top of a seaside cliff. The function which gives the stone's height  $h$  (in m) above sea level as a function of time  $t$  (in sec) since it was thrown has the rule:  $h = -t^2 + 12t + 160$ . Find the interval of time over which the height of the stone is at least 180 m above sea level. \_\_\_\_\_

11. The height  $h$ , in metres, of a diver relative to the water level is described by the rule  $h = \frac{1}{2}t^2 - 6t + 10$  where  $t$  represents the elapsed time, in seconds, since the start of the dive. How long did the diver remain underwater? \_\_\_\_\_

12. A projectile is thrown upward from a height of 12 m. After 10 seconds, it reaches its maximum height and after 24 seconds, it hits the ground. Knowing that its trajectory follows the rule of a quadratic function, find the elapsed time between the moment it reaches a height of 6.5 m, on its descent, and the time when it hits the ground. \_\_\_\_\_



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## ANSWERS (Quadratic Functions – Extra Practice)

1. Determine the domain and range of the following functions.

a)  $f(x) = -3(x - 2)^2 + 5$

$\text{dom } f = \mathbb{R}$

$\text{ran } f = ]-\infty, 5]$

b)  $f(x) = 2x^2 + 4x - 9$

$\text{dom } f = \mathbb{R}$

$\text{ran } f = [-11, +\infty[$

2. Determine the zeros of the function  $f(x) = -3(x + 1)^2 + 12$ .  $x_1 = -3$  and  $x_2 = 1$

3. Determine the y-intercept of  $f(x) = -\frac{1}{2}(x + 4)^2 + 9$ .  $y = 1$

4. Determine over what interval the function  $f(x) = 2x^2 - 5x - 3$  is positive.

$f(x) \geq 0$  over  $]-\infty, -\frac{1}{2}] \cup [3, +\infty[$

5. Determine over what interval the function  $f(x) = 3x^2 + 6x - 5$  is increasing.  $[-1, +\infty[$

6. Determine the extrema of the function  $f(x) = -2x^2 + 12x - 7$ .  $\text{max } f = 11$

7. What is the axis of symmetry of the function  $f(x) = -\frac{1}{4}x^2 + 3x + 1$ ?  $x = 6$

8. Determine the values of  $x$  for which the function  $f(x) = -3(x + 4)^2 + 5$  is equal to  $-7$ .

$x = -6$  or  $x = -2$

9. Find the rule of the quadratic function represented by a parabola with a vertex at  $V(-1, 5)$  and passing through the point  $P(1, 3)$ .

$y = -\frac{1}{2}(x + 1)^2 + 5$

10. A stone is thrown upward from the top of a seaside cliff. The function which gives the stone's height  $h$  (in m) above sea level as a function of time  $t$  (in sec) since it was thrown has the rule:  
 $h = -t^2 + 12t + 160$ .

Find the interval of time over which the height of the stone is at least 180 m above sea level.

**Between the instants  $t = 2$  and  $t = 10$  seconds after it was thrown.**

11. The height  $h$ , in metres, of a diver relative to the water level is described by the rule

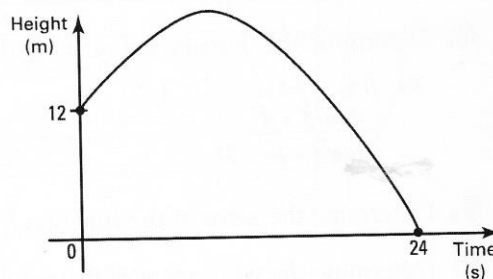
$h = \frac{1}{2}t^2 - 6t + 10$  where  $t$  represents the elapsed time, in seconds, since the start of the dive.

How long did the diver remain underwater?

**During 8 seconds.**

12. A projectile is thrown upward from a height of 12 m. After 10 seconds, it reaches its maximum height and after 24 seconds, it hits the ground. Knowing that its trajectory follows the rule of a quadratic function, find the elapsed time between the moment it reaches a height of 6.5 m, on its descent, and the time when it hits the ground.

$y = -\frac{1}{8}(x + 4)(x - 24)$



**It reaches, on its descent, a height of 6.5 m at the instant  $t = 22$  sec. The elapsed time is therefore 2 sec.**