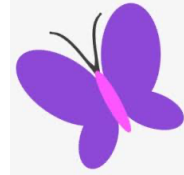


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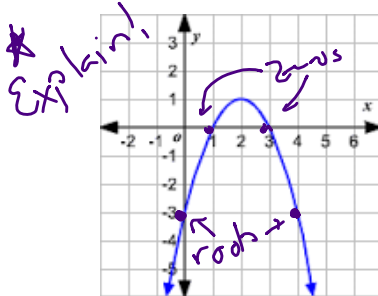
← two sides



### 6.1 Solving Quadratic Equations

$$\text{Quadratic Equation in Standard Form: } ax^2 + bx + c = 0$$

In order to solve a quadratic equation, we must make sure to put it in to standard form as shown above, and then we can find the values of  $x$  that satisfy the equations (**roots**) by **graphing** or by **factoring**. We have already done this in chapter 4.



Zeros are specific examples of **roots**, or solutions, that occur when  $y = 0$ .

However, we can also find roots, or solutions, for values of  $x$  that satisfy the equation when  $y$  equals another number. For example, when  $y = -3$ ,  $x = 0$  and  $x = 4$ . These are still roots, but they are not zeros!

#### Practice Problems

1) Solve each quadratic equation by factoring.

a)  $-2x^2 - 9x + 5 = 0$   
 $-(2x^2 + 9x - 5) = 0$   
 $-(2x^2 + 10x - 1x - 5) = 0$   
 $-[2x(x+5) - 1(x+5)] = 0$   
 $-(2x-1)(x+5) = 0$   
 $2x-1 = 0 \quad x+5 = 0$   
 $x = \frac{1}{2} \quad x = -5$

b)  $3x(x+2) = 2x^2 - (4-x)$   
 $3x^2 + 6x = 2x^2 - 4 + x$   
 $x^2 + 5x + 4 = 0$   
 $(x+4)(x+1) = 0$   
 $x = -4 \quad x = -1$

*Handwritten notes for problem b:*  
 $a = -10$   
 $b = 7$   
 $(10)(-1) = -10$   
 $(10)+(-1) = 9$

2) A ball is thrown from the top of a cliff. Its height,  $h$ , in meters, above the ground after  $t$  seconds can be modelled by  $h = -5t^2 + 21t + 120$ . How long will the ball take to fall 20 m below its initial height?

*Handwritten solution for problem 2:*

$y$ -int:  $h = 120$   
 $h = -5t^2 + 21t + 120$   
 $100 = -5t^2 + 21t + 120$   
 $5t^2 - 21t - 20 = 0$   
 $5t^2 - 25t + 4t - 20 = 0$   
 $5t(t-5) + 4(t-5) = 0$   
 $(5t+4)(t-5) = 0$   
 $t = 5$   
 $\therefore$  The ball reaches 100 m after 5 seconds.

*Diagram:* A sketch of a cliff on the left. A dashed vertical line represents the initial height. A purple parabolic path starts at the cliff edge and goes down to a point labeled  $(t, 100)$ . The initial height is labeled  $h = 120$ . The point  $(t, 100)$  is 20 meters below the initial height. The equation  $5t + 4 = 0$  is crossed out, and  $t = \frac{-4}{5}$  is written below it.