

## 5.2 Solving From Factored Form

Recall: Equations in Factored Form

Where are the zeros/ x-intercepts?

Equation	$y = (x - 4)(x + 2)$	$y = x(x - 5)$	$y = (x + 3)^2$
Roots (Zeros)	$x = 4$ $x = -2$	$x = 0$ $x = 5$	$x = -3$
Sketch			

Recall: The zeros/x-intercepts/roots are the values of  $x$  that cause the function,  $y$ , to equal zero.

If  $(a)(b) = 0$ , either  $a = 0$  or  $b = 0$ .

Ex. 1 What are the zeros for each quadratic function?

<p>When does this factor =0?</p>	<p>When does this factor =0?</p>	<p>When does this factor =0?</p>	<p>When does this factor =0?</p>	<p>When does this factor =0?</p>
$y = (2x + 1)(3x - 2)$	$y = x(5x - 2)$	$y = (2x + 7)^2$		
$2x + 1 = 0$ $2x = -1$ $x = -\frac{1}{2}$ $3x - 2 = 0$ $3x = 2$ $x = \frac{2}{3}$	$x = 0$ $5x - 2 = 0$ $5x = 2$ $x = \frac{2}{5}$	$2x + 7 = 0$ $2x = -7$ $x = -\frac{7}{2}$		

Ex. 2 Solve. (find the roots/x-intercepts/zeros/solutions)

a)  $(x - 5)(2x + 3) = 0$

$$\begin{array}{l} x - 5 = 0 \\ x = 5 \end{array} \quad \begin{array}{l} 2x + 3 = 0 \\ 2x = -3 \\ x = -\frac{3}{2} \end{array}$$

b)  $x(3x - 5) = 0$

$$\begin{array}{l} x = 0 \\ 3x - 5 = 0 \\ 3x = 5 \\ x = \frac{5}{3} \end{array}$$

c)  $(x - 3)(x + 3) = 0$

$$\begin{array}{l} \swarrow \quad \downarrow \\ x = 3 \quad x = -3 \end{array}$$

d)  $(5x - 1)^2 = 0$

$$\begin{array}{l} 5x - 1 = 0 \\ 5x = 1 \\ x = \frac{1}{5} \end{array}$$

e)  $(3x - 2)(2x + 7) = 0$

$$\begin{array}{l} 3x - 2 = 0 \\ 3x = 2 \\ x = \frac{2}{3} \end{array} \quad \begin{array}{l} 2x + 7 = 0 \\ 2x = -7 \\ x = -\frac{7}{2} \end{array}$$

f)  $6x(3x + 4) = 0$

$$\begin{array}{l} x = 0 \\ 3x + 4 = 0 \\ 3x = -4 \\ x = -\frac{4}{3} \end{array}$$

g)  $(2x + 5)(3x + 7) = 0$

$$\begin{array}{l} 2x + 5 = 0 \\ 2x = -5 \\ x = -\frac{5}{2} \end{array} \quad \begin{array}{l} 3x + 7 = 0 \\ x = -\frac{7}{3} \end{array}$$

h)  $-x(5x - 1) = 0$

$$\begin{array}{l} x = 0 \\ 5x - 1 = 0 \\ x = \frac{1}{5} \end{array}$$

Ex. 3 Determine a quadratic equation in FACTORED form having these roots.

a) 3, -2

$$\begin{aligned} x=3 & \quad x=-2 \\ x-3=0 & \quad x+2=0 \\ \downarrow & \quad \downarrow \\ 0 & = (x-3)(x+2) \end{aligned}$$

b) 0, 5

$$\begin{aligned} x=0 & \quad x=5 \\ x-0=0 & \quad x-5=0 \\ \downarrow & \quad \downarrow \\ 0 & = x(x-5) \end{aligned}$$

c) 4, -4

$$0 = (x-4)(x+4)$$

d) only one root at -7

$$\begin{aligned} x & = -7 \\ x+7 & = 0 \\ 0 & = (x+7)^2 \end{aligned}$$

e)  $\frac{3}{4}, -\frac{1}{2}$

$$\begin{aligned} x & = \frac{3}{4} & x & = -\frac{1}{2} \\ 4x & = 3 & 2x & = -1 \\ 4x-3 & = 0 & 2x+1 & = 0 \\ 0 & = (4x-3)(2x+1) \end{aligned}$$

f)  $\frac{5}{2}, \frac{-2}{7}$

$$\begin{aligned} x & = \frac{5}{2} & x & = \frac{-2}{7} \\ 2x & = 5 & 7x & = -2 \\ 2x-5 & = 0 & 7x+2 & = 0 \\ 0 & = (2x-5)(7x+2) \end{aligned}$$

**Standard Form**

- no brackets
- starts with  $x^2$  term
- constant term is at the end
- all like terms are combined

$y = ax^2 + bx + c$   
 $0 = ax^2 + bx + c$

quadratic function

quadratic equation

Ex. 4 Determine a quadratic function in STANDARD form having these roots.

a) 5, 1

$$\begin{aligned} x=5 & \quad x=1 \\ x-5=0 & \quad x-1=0 \\ \text{Factored form} \rightarrow & \\ 0 & = (x-5)(x-1) \\ & = x^2 - x - 5x + 5 \\ & = x^2 - 6x + 5 \\ \text{Standard form} \rightarrow & \end{aligned}$$

Change from factored form to standard form by **MULTIPLYING**

$x$	$x$	$-5$
$x$	$x^2$	$-5x$
$-1$	$-x$	$5$

$$\begin{aligned} 0 & = (5x+3)(2x-1) \\ & = 10x^2 + x - 3 \end{aligned}$$

b)  $\frac{-3}{5}, \frac{1}{2}$

$$\begin{aligned} x & = \frac{-3}{5} & x & = \frac{1}{2} \\ 5x & = -3 & 2x & = 1 \\ 5x+3 & = 0 & 2x-1 & = 0 \end{aligned}$$

$2x$	$5x$	$3$
$2x$	$10x^2$	$6x$
$-1$	$-5x$	$-3$