

Day 2: Solving Quadratics by Factoring ($a=1$)

Review:

Solutions to quadratic functions are found where the function crosses the X-axis.

The y-value at these points is always 0.

Other words for solutions are roots, X-intercepts, Zeros.

For the expressions below, factor out the GCF and then solve the given quadratic expression.

a) $-3x^2 + 12x = 0$ GCF = $-3x$
 $\frac{-3x^2}{-3x} \quad \frac{12x}{-3x}$

b) $2x^2 - 8x = 0$ GCF = $2x$
 $\frac{2x^2}{2x} \quad \frac{-8x}{2x}$

c) $2x^2 + 5x = 0$ GCF = x
 $\frac{2x^2}{x} \quad \frac{5x}{x}$

$-3x(x-4) = 0$
 $\frac{-3x}{-3} = 0 \quad \left\{ \begin{array}{l} x-4=0 \\ +4 \quad +4 \end{array} \right.$
 $x = 0 \quad x = 4$

$2x(x-4) = 0$
 $\frac{2x}{2} = 0 \quad \left\{ \begin{array}{l} x-4=0 \\ +4 \quad +4 \end{array} \right.$
 $x = 2 \quad x = 4$

$x(2x+5) = 0$
 $x = 0 \quad \left\{ \begin{array}{l} 2x+5=0 \\ -5 \quad -5 \\ \frac{2x}{2} = \frac{-5}{2} \end{array} \right.$
 $x = 0 \quad x = -\frac{5}{2} \text{ or } -2.5$

Solving Quadratic Functions with Factoring

Solve the quadratic functions below using the Zero Product Property.

1) $y = (x+4)(x+3)$
 $\frac{x+4=0}{-4 \quad -4} \quad \left\{ \begin{array}{l} x+3=0 \\ -3 \quad -3 \end{array} \right.$
 $x = -4 \quad x = -3$
 $x = -4, x = -3$

2) $f(x) = (x-7)(x+5)$
 $\frac{x-7=0}{+7 \quad +7} \quad \left\{ \begin{array}{l} x+5=0 \\ -5 \quad -5 \end{array} \right.$
 $x = 7 \quad x = -5$
 $x = 7, x = -5$

3) $y = x(x-9)$
 $x = 0 \quad \left\{ \begin{array}{l} x-9=0 \\ +9 \quad +9 \end{array} \right.$
 $x = 9$
 $x = 0, x = 9$

4) $f(x) = (x-4)(x+8)$ ignore... tells direction of graph
 $\frac{x-4=0}{+4 \quad +4} \quad \left\{ \begin{array}{l} x+8=0 \\ -8 \quad -8 \end{array} \right.$
 $x = 4 \quad x = -8$
 $x = 4, x = -8$

Solve the following quadratic expressions.

1) $x^2 + 12x + 32 = 0$ $a=1$ $b=12$ $c=32$
 $x^2 + 12x + 32 \rightarrow x^2 + 4x + 8x + 32$

$$\begin{array}{r} 32 \\ 4 \times 8 \\ 12 \end{array}$$

$$\begin{array}{r} 32 \\ 1 \ 32 \\ 2 \ 16 \\ 4 \ 8 \end{array}$$

	X	4
X	X ²	4X
8	8X	32

2) $x^2 + 8x + 15 = 0$ $a=1$ $b=8$ $c=15$
 $x^2 + 8x + 15 \rightarrow x^2 + 3x + 5x + 15$

$$\begin{array}{r} 15 \\ 3 \times 5 \\ 8 \end{array}$$

$$\begin{array}{r} 15 \\ 1 \ 15 \\ 3 \ 5 \end{array}$$

	X	3
X	X ²	3X
5	5X	15

Factored Form: $(X+4)(X+8) = 0$

$$\begin{array}{l} X+4=0 \\ -4 \ -4 \\ \hline X=-4 \end{array} \left\{ \begin{array}{l} X+8=0 \\ -8 \ -8 \\ \hline X=-8 \end{array} \right.$$

Zeros: $X=-4$
 $X=-8$

Factored Form: $(X+5)(X+3) = 0$

$$\begin{array}{l} X+5=0 \\ -5 \ -5 \\ \hline X=-5 \end{array} \left\{ \begin{array}{l} X+3=0 \\ -3 \ -3 \\ \hline X=-3 \end{array} \right.$$

Zeros: $X=-5, X=-3$

3) $x^2 - 9x + 20 = 0$ $a=1$ $b=-9$ $c=20$

$$\begin{array}{r} 20 \\ -4 \times -5 \\ -9 \end{array}$$

$$\begin{array}{r} 20 \\ 1 \ 20 \\ -1 \ -20 \\ 4 \ 5 \\ -4 \ -5 \end{array}$$

$x^2 - 9x + 20 \rightarrow$
 $x^2 - 4x - 5x + 20$

	X	-4
X	X ²	-4X
-5	-5X	20

Factored Form: $(X-4)(X-5) = 0$

$$\begin{array}{l} X-4=0 \\ +4 \ +4 \\ \hline X=4 \end{array} \left\{ \begin{array}{l} X-5=0 \\ +5 \ +5 \\ \hline X=5 \end{array} \right.$$

Zeros: $X=4, X=5$

4) $x^2 - 7x + 10 = 0$ $a=1$ $b=-7$ $c=10$

$$\begin{array}{r} 10 \\ -2 \times -5 \\ -7 \end{array}$$

$$\begin{array}{r} 10 \\ -1 \ -10 \\ -2 \ -5 \end{array}$$

$x^2 - 7x + 10 = 0 \rightarrow x^2 - 2x - 5x + 10$

	X	-2
X	X ²	-2X
-5	-5X	10

Factored Form: $(X-5)(X-2) = 0$

$$\begin{array}{l} X-5=0 \\ +5 \ +5 \\ \hline X=5 \end{array} \left\{ \begin{array}{l} X-2=0 \\ +2 \ +2 \\ \hline X=2 \end{array} \right.$$

Zeros: $X=5, X=2$

5) $y = x^2 - 14x + 48$ $a=1$ $b=-14$ $c=48$

$$\begin{array}{r} 48 \\ -8 \quad -6 \\ \hline -14 \end{array}$$

$$\begin{array}{r} 48 \\ -1 \quad -48 \\ -8 \quad -6 \end{array}$$

$$x^2 - 14x + 48 \rightarrow x^2 - 8x - 6x + 48$$

	x	-8
x	x^2	$-8x$
-6	$-6x$	48

Factored Form: $(x-8)(x-6) = 0$

$$\begin{array}{r} x-8=0 \\ +8 \quad +8 \\ \hline x=8 \end{array}$$

$$\begin{array}{r} x-6=0 \\ +6 \quad +6 \\ \hline x=6 \end{array}$$

Zeros: $x=8, x=6$

6) $x^2 - 3x - 10 = 8$ $a=1$ $b=-3$ $c=-18$

$$\begin{array}{r} -8 \quad -8 \\ \hline x^2 - 3x - 18 = 0 \end{array}$$

$$x^2 - 3x - 18 \rightarrow x^2 - 6x + 3x - 18$$

$$\begin{array}{r} -18 \\ -6 \quad 3 \\ \hline -3 \end{array}$$

$$\begin{array}{r} -18 \\ 2 \quad -9 \\ +9 \quad -2 \\ \hline -6 \quad 3 \\ \hline 6 \quad -3 \end{array}$$

	x	-6
x	x^2	$-6x$
3	$3x$	-18

Factored Form: $(x-6)(x+3) = 0$

$$\begin{array}{r} x-6=0 \\ +6 \quad +6 \\ \hline x=6 \end{array}$$

$$\begin{array}{r} x+3=0 \\ -3 \quad -3 \\ \hline x=-3 \end{array}$$

Zeros: $x=6, x=-3$

7) $x^2 + 4x = 32$ $a=1$ $b=4$ $c=-32$

$$\begin{array}{r} -32 \\ 8 \quad -4 \\ \hline 4 \end{array}$$

$$\begin{array}{r} -32 \\ 1 \quad -32 \\ -1 \quad 32 \\ \hline 8 \quad -4 \\ \hline 4 \quad -8 \end{array}$$

$$x^2 + 4x - 32 = 0 \rightarrow x^2 + 4x - 32 \rightarrow x^2 + 8x - 4x - 32$$

	x	8
x	x^2	$8x$
-4	$-4x$	-32

Factored Form: $(x-4)(x+8) = 0$

$$\begin{array}{r} x-4=0 \\ +4 \quad +4 \\ \hline x=4 \end{array}$$

$$\begin{array}{r} x+8=0 \\ -8 \quad -8 \\ \hline x=-8 \end{array}$$

Zeros: $x=4, x=-8$

8) $f(x) = x^2 + 5x + 6$ $a=1$ $b=5$ $c=6$

$$\begin{array}{r} 6 \\ 2 \quad 3 \\ \hline 5 \end{array}$$

$$\begin{array}{r} 6 \\ 1 \quad 4 \\ \hline 2 \quad 3 \end{array}$$

$$x^2 + 5x + 6 \rightarrow x^2 + 2x + 3x + 6$$

	x	2
x	x^2	$2x$
3	$3x$	6

Factored Form: $(x+2)(x+3) = 0$

$$\begin{array}{r} x+2=0 \\ -2 \quad -2 \\ \hline x=-2 \end{array}$$

$$\begin{array}{r} x+3=0 \\ -3 \quad -3 \\ \hline x=-3 \end{array}$$

Zeros: $x=-2, x=-3$