

Roots of Quadratics

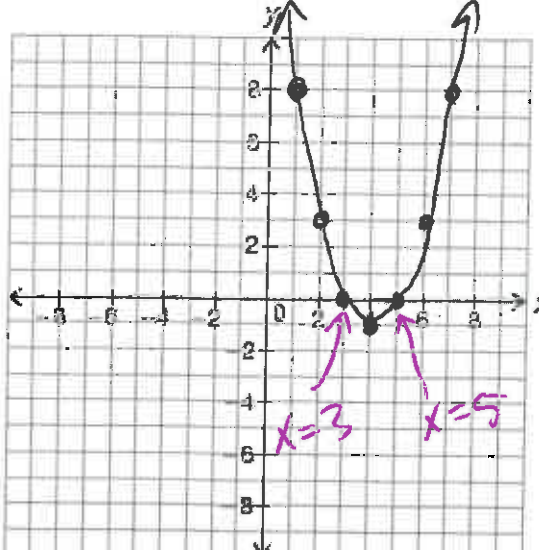
What is a **Quadratic Equation**? $ax^2 + bx + c = 0$

What are **X-INTERCEPTS** of a quadratic? where graph crosses x-axis: $(x, 0)$

What are **ROOTS** of a quadratic? the x-coordinate of the x-intercept.

What are **ZEROS** of a quadratic? Same as roots.

How to find the roots/zeros of a quadratic using algebra:

<p>Steps:</p>	$x^2 + 15 = 8x$																
<p>1. Move each term to one side of the equation, making the other side zero.</p>	$x^2 - 8x + 15 = 0$																
<p>2. Factor the expression (GCF, Diff 2 Squares, AC Method)</p>	$x^2 - 5x - 3x + 15 = 0$ $x(x-5) - 3(x-5) = 0$ $(x-5)(x-3) = 0$																
<p>3. Set each factor equal to zero.</p>	$x-5=0 \quad \quad x-3=0$																
<p>4. Solve each factor for x.</p>	$\frac{+5}{x=5} \quad \frac{+3}{x=3}$																
<p>5. Check, by plugging the roots back into the original quadratic or by graphing the quadratic.</p> $5^2 - 8(5) + 15$ $= 25 - 40 + 15$ $= -15 + 15$ $= 0$ <p>✓</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <thead> <tr> <th>x</th> <th>y</th> </tr> </thead> <tbody> <tr><td>1</td><td>8</td></tr> <tr><td>2</td><td>3</td></tr> <tr><td>3</td><td>0</td></tr> <tr><td>4</td><td>-1</td></tr> <tr><td>5</td><td>0</td></tr> <tr><td>6</td><td>3</td></tr> <tr><td>7</td><td>8</td></tr> </tbody> </table>	x	y	1	8	2	3	3	0	4	-1	5	0	6	3	7	8	
x	y																
1	8																
2	3																
3	0																
4	-1																
5	0																
6	3																
7	8																

Determine the roots of each quadratic, algebraically.

1. $x^2 - 8x + 12 = 0$

$$x^2 - 6x - 2x + 12 = 0$$

$$x(x-6) - 2(x-6) = 0$$

$$(x-6)(x-2) = 0$$

$$x-6=0 \quad | \quad x-2=0$$

$$x=6 \quad | \quad x=2$$

2. $x^2 - 5x - 24 = 0$

$$x^2 - 8x + 3x - 24 = 0$$

$$x(x-8) + 3(x-8) = 0$$

$$(x-8)(x+3) = 0$$

$$x-8=0 \quad | \quad x+3=0$$

$$x=8 \quad | \quad x=-3$$

3. $x^2 - 36 = 0$

$$(x-6)(x+6) = 0$$

$$x-6=0 \quad | \quad x+6=0$$

$$x=6 \quad | \quad x=-6$$

4. $x^2 - 11x = 0$

$$x(x-11) = 0$$

$$x=0 \quad | \quad x-11=0$$

$$x=11$$

5. $x^2 + 8x = -7$

$$x^2 + 8x + 7 = 0$$

$$x^2 + 7x + x + 7 = 0$$

$$x(x+7) + (x+7) = 0$$

$$(x+7)(x+1) = 0$$

$$x+7=0 \quad | \quad x+1=0$$

$$x=-7 \quad | \quad x=-1$$

6. $x^2 - 5x = 13x - 81$

$$x^2 - 18x + 81 = 0$$

$$x^2 - 9x - 9x + 81 = 0$$

$$x(x-9) - 9(x-9) = 0$$

$$(x-9)(x-9) = 0$$

$$x-9=0 \quad | \quad x-9=0$$

$$x=9 \quad | \quad x=9$$

$$3(7) = 21$$

$$7. 3x^2 - 22x + 7 = 0$$

$$3x^2 - 21x - x + 7 = 0$$

$$3x(x-7) - (x-7) = 0$$

$$(x-7)(3x-1) = 0$$

$$x-7=0$$

$$x=7$$

$$3x-1=0$$

$$x = \frac{1}{3}$$

$$9. \frac{2}{3}x^2 - \frac{5}{6}x = 0$$

$$8(21) = 168$$

$$8. 8x^2 + 2x - 21 = 0$$

$$8x^2 + 14x - 12x - 21 = 0$$

$$2x(4x+7) - 3(4x+7) = 0$$

$$(4x+7)(2x-3) = 0$$

$$4x+7=0$$

$$x = -\frac{7}{4}$$

$$2x-3=0$$

$$x = \frac{3}{2}$$

