

Solve each of the following using the quadratic formula.

1. $x^2 + 3x - 4 = 0$

$A = 1, B = 3, C = -4$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(1)(-4)}}{2(1)}$$

$$x = \frac{-3 \pm \sqrt{9 + 16}}{2}$$

$$x = \frac{-3 \pm \sqrt{25}}{2}$$

$$x = \frac{-3+5}{2} \quad \text{or} \quad x = \frac{-3-5}{2}$$

$$x = \frac{2}{2} \quad x = \frac{-8}{2}$$

$$x = 1 \quad x = -4$$

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

$A = 2, B = 3, C = -7$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(2)(-7)}}{2(2)}$$

$$x = \frac{-3 \pm \sqrt{9 + 56}}{4}$$

$$x = \frac{-3 \pm \sqrt{65}}{4}$$

3. $x^2 + 12x + 36 = 0$

$A = 1, B = 12, C = 36$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-12 \pm \sqrt{12^2 - 4(1)(36)}}{2(1)}$$

$$x = \frac{-12 \pm \sqrt{144 - 144}}{2}$$

$$x = \frac{-12 \pm \sqrt{0}}{2}$$

$$x = \frac{-12}{2} = -6$$

4. $x^2 + 3x + 6 = 0$

$A = 1, B = 3, C = 6$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(1)(6)}}{2(1)}$$

$$x = \frac{-3 \pm \sqrt{9 - 24}}{2}$$

$$x = \frac{-3 \pm \sqrt{-15}}{2}$$

$$x = \frac{-3 \pm i\sqrt{15}}{2}$$

5. $4x^2 + 12x + 9 = 0$

$A = 4, B = 12, C = 9$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-12 \pm \sqrt{12^2 - 4(4)(9)}}{2(4)}$$

$$x = \frac{-12 \pm \sqrt{144 - 144}}{8}$$

$$x = \frac{-12 \pm \sqrt{0}}{8}$$

$$x = \frac{-12}{8} = -1\frac{1}{2}$$

6. $-2x^2 + 3x + 5 = 0$

$A = -2, B = 3, C = 5$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4(-2)(5)}}{2(-2)}$$

$$x = \frac{-3 \pm \sqrt{9 + 40}}{-4}$$

$$x = \frac{-3 \pm \sqrt{49}}{-4}$$

$$x = \frac{-3+7}{-4} \quad \text{or} \quad x = \frac{-3-7}{-4}$$

$$x = \frac{4}{-4} \quad x = \frac{-10}{-4}$$

$$x = -1 \quad x = 2\frac{1}{2}$$

7. $10x^2 + 17x - 92 = 0$

$A = 10, B = 17, C = -92$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-17 \pm \sqrt{17^2 - 4(10)(-92)}}{2(10)}$$

$$x = \frac{-17 \pm \sqrt{289 + 3680}}{20}$$

$$x = \frac{-17 \pm \sqrt{3969}}{20}$$

$$x = \frac{-17+63}{20} \quad \text{or} \quad x = \frac{-17-63}{20}$$

$$x = \frac{46}{20} \quad x = \frac{-80}{20}$$

$$x = 2.3 \quad x = -4$$

8. $3x^2 + 6x + 5 = 0$

$A = 3, B = 6, C = 5$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-6 \pm \sqrt{6^2 - 4(3)(5)}}{2(3)}$$

$$x = \frac{-6 \pm \sqrt{36 - 60}}{6}$$

$$x = \frac{-6 \pm \sqrt{-24}}{6}$$

$$x = \frac{-6 \pm i\sqrt{24}}{6}$$

$$x = \frac{-6 \pm 2i\sqrt{6}}{6}$$

$$x = \frac{-3 \pm i\sqrt{6}}{3}$$

Solve for the roots of each of the following using the quadratic formula. Then graph each function.

9. $f(x) = 3x^2 + x - 4$

$A = 3, B = 1, C = -4$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-1 \pm \sqrt{1^2 - 4(3)(-4)}}{2(3)}$$

$$x = \frac{-1 \pm \sqrt{1 + 48}}{6}$$

$$x = \frac{-1 \pm \sqrt{49}}{6}$$

$$x = \frac{-1+7}{6} \quad \text{or} \quad x = \frac{-1-7}{6}$$

$$x = \frac{6}{6} \quad x = \frac{-8}{6}$$

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

$(1, 0)$ or $(-1\frac{1}{3}, 0)$

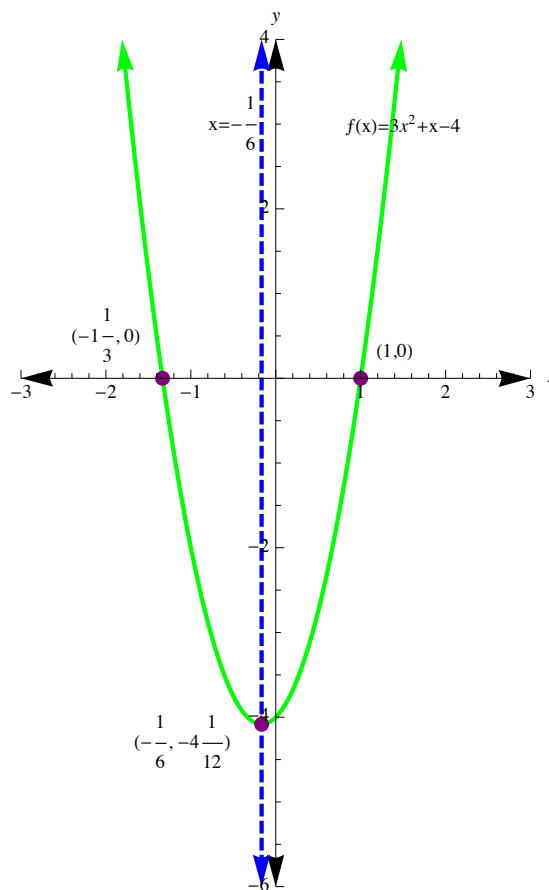
Vertex : $x = \frac{-B}{2A} = \frac{-1}{2(3)} = \frac{-1}{6} = -\frac{1}{6}$

$f(-\frac{1}{6}) = 3(-\frac{1}{6})^2 + (-\frac{1}{6}) - 4 = -4\frac{1}{12}$

Vertex : $(-\frac{1}{6}, -4\frac{1}{12})$

Axis of symmetry : $x = -\frac{1}{6}$

y - int : $(0, -4)$



10. $f(x) = x^2 - 4 - 3x$

$f(x) = x^2 - 3x - 4$

$A = 1, B = -3, C = -4$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-4)}}{2(1)}$$

$$x = \frac{3 \pm \sqrt{9 + 16}}{2}$$

$$x = \frac{3 \pm \sqrt{25}}{2}$$

$x = \frac{3+5}{2}$ or $x = \frac{3-5}{2}$

$x = \frac{8}{2}$ $x = \frac{-2}{2}$

$x = 4$ $x = -1$

$(4, 0)$ or $(-1, 0)$

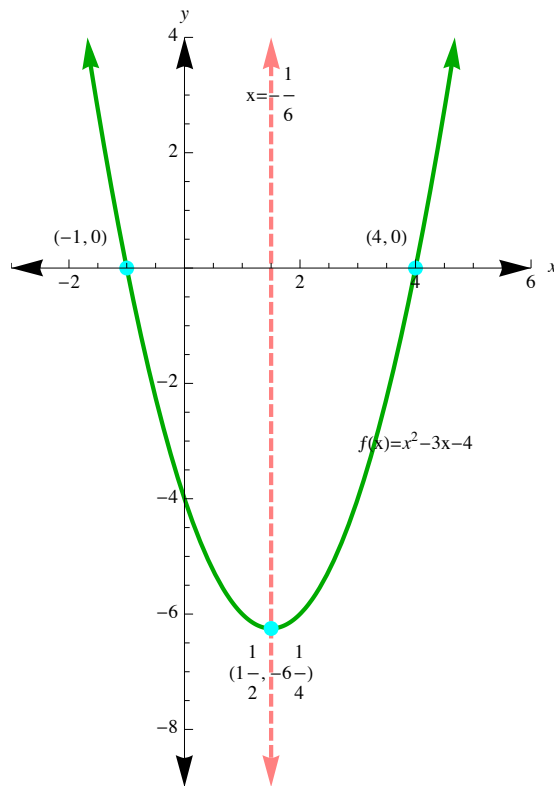
Vertex : $x = \frac{-B}{2A} = \frac{-(-3)}{2(1)} = \frac{3}{2} = 1\frac{1}{2}$

$f\left(\frac{3}{2}\right) = \left(\frac{3}{2}\right)^2 - 3\left(\frac{3}{2}\right) - 4 = -6\frac{1}{4}$

Vertex : $\left(1\frac{1}{2}, -6\frac{1}{4}\right)$

Axis of symmetry : $x = 1\frac{1}{2}$

y - int : $(0, -4)$



11. $f(x) = x^2 - 5x + 25$

$A = 1, B = -5, C = 25$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(25)}}{2(1)}$$

$$x = \frac{5 \pm \sqrt{25 - 100}}{2}$$

$$x = \frac{5 \pm \sqrt{-75}}{2}$$

$$x = \frac{5 \pm i\sqrt{75}}{2}$$

$$x = \frac{5 \pm 5i\sqrt{3}}{2}$$

Vertex : $x = \frac{-B}{2A} = \frac{-(-5)}{2(1)} = \frac{5}{2} = 2\frac{1}{2}$

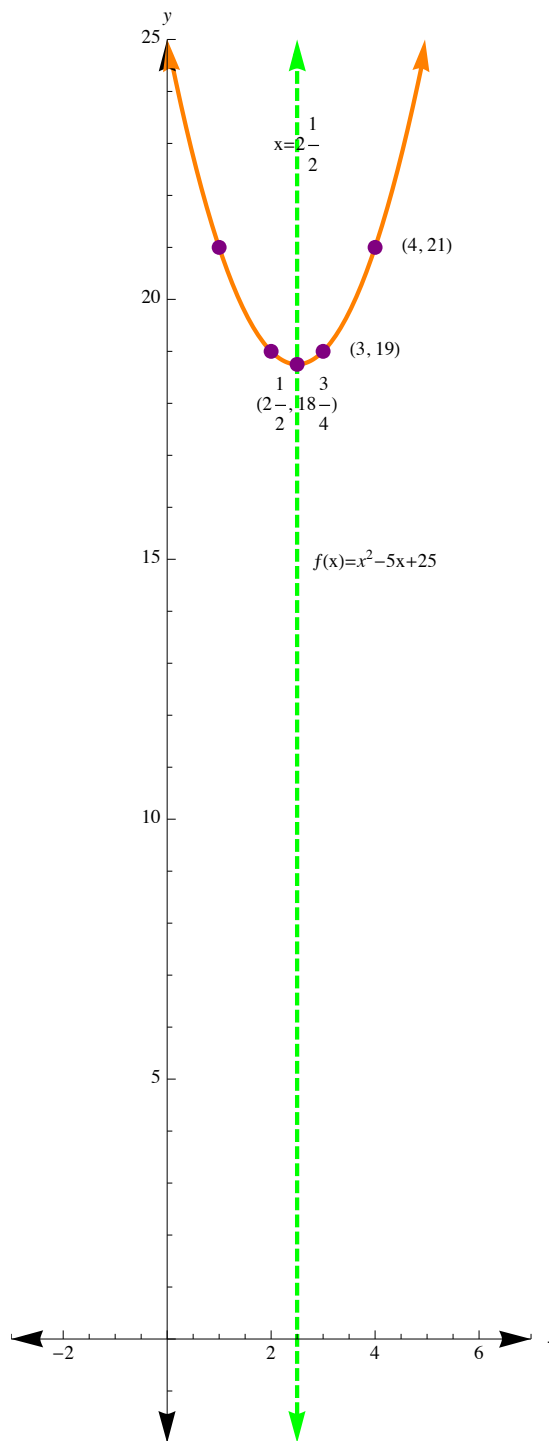
$f\left(\frac{5}{2}\right) = \left(\frac{5}{2}\right)^2 - 5\left(\frac{5}{2}\right) + 25 = 18\frac{3}{4}$

Vertex : $\left(2\frac{1}{2}, 18\frac{3}{4}\right)$

x	y	(x, y)
1	21	(1, 21)
2	19	(2, 19)
$2\frac{1}{2}$	$18\frac{3}{4}$	$\left(2\frac{1}{2}, 18\frac{3}{4}\right)$
3	19	(3, 19)
4	21	(4, 21)

Axis of symmetry : $x = 2\frac{1}{2}$

y - int : $(0, -4)$



12. $f(x) = -4x^2 + 3x - 7$

$A = -4, B = 3, C = -7$

$$x = \frac{-B \pm \sqrt{B^2 - 4AC}}{2A}$$

$$x = \frac{-(3) \pm \sqrt{(3)^2 - 4(-4)(-7)}}{2(-4)}$$

$$x = \frac{-3 \pm \sqrt{9 - 112}}{-8}$$

$$x = \frac{-3 \pm \sqrt{-103}}{-8}$$

$$x = \frac{-3 \pm i\sqrt{103}}{-8}$$

Vertex : $x = \frac{-B}{2A} = \frac{-(3)}{2(-4)} = \frac{-3}{-8} = \frac{3}{8}$

$f\left(\frac{3}{8}\right) = -4\left(\frac{3}{8}\right)^2 + 3\left(\frac{3}{8}\right) - 7 = -6\frac{7}{16}$

Vertex : $\left(\frac{3}{8}, -6\frac{7}{16}\right)$

x	y	(x, y)
-1	-14	$(-1, -14)$
0	-7	$(0, -7)$
$\frac{3}{8}$	$-6\frac{7}{16}$	$\left(\frac{3}{8}, -6\frac{7}{16}\right)$
1	-8	$(1, -8)$
2	-17	$(2, -17)$

Axis of symmetry : $x = \frac{3}{8}$

y - int : $(0, -7)$

