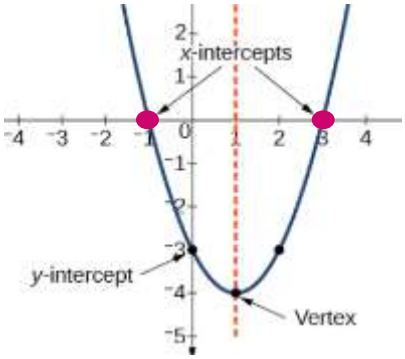
1.7 Quadratic Equation

Finding x-intercepts



Quadratic Formula

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

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

1) Solve the equation using the Quadratic Formula.

$3x^2 - 14x = 5$ put in order $ax^2 + bx + c = 0$

$3x^2 - 14x - 5 = 0$ a = 3 b = -14 c = -5

$$x = \frac{14 \pm \sqrt{14^2 - 4(3)(-5)}}{2(3)} = \frac{14 \pm \sqrt{14^2 - 4(3)(-5)}}{2(3)} = \frac{14 \pm \sqrt{256}}{6} = \frac{14 \pm 16}{6}$$

separate the answers: $\frac{14+16}{6} = \frac{30}{6} = 5$ and $\frac{14-16}{6} = \frac{-2}{6} = -\frac{1}{3}$

X = $5, -\frac{1}{3}$

2) Write the equation in the form $ax^2 + bx + c = 0$ where $a > 0$, if necessary. Then identify the values of a, b, and c. Do not actually solve the equation.

$3x^2 + 4x + 12 = 0$ a = 3 b = 4 c = 12

3) Write the equation in the form $ax^2 + bx + c = 0$ where $a > 0$, if necessary. Then identify the values of a, b, and c. Do not actually solve the equation.

$2x^2 = 3x + 11$ put in order $ax^2 + bx + c = 0$

$2x^2 - 3x - 11 = 0$ a = 3 b = 4 c = 12

4) Write the equation in standard form, $ax^2 + bx + c = 0$, where $a > 0$, if necessary. Then identify the values of a, b, and c.

$2x^2 = -8x$ put in order $ax^2 + bx + c = 0$

$2x^2 - 3x - 11 = 0$ a = 3 b = 4 c = 12

5) Use the quadratic formula to solve the equation.

PERFECT SQUARES: 4,9,16,36,49..

$2x^2 - 7x = 1$ put in order $ax^2 + bx + c = 0$

$2x^2 - 7x - 1 = 0$ $a = 2$ $b = -7$ $c = -1$

$$x = \frac{7 \pm \sqrt{7^2 - 4(2)(-1)}}{2(2)} = \frac{7 \pm \sqrt{57}}{4}$$ $\sqrt{57}$ *does not come out even, no perfect square #s*

separate the answers: $X = \frac{7+\sqrt{57}}{4}, \frac{7-\sqrt{57}}{4}$

6) Use the quadratic formula to solve the equation.

$3x^2 - 5x - 7 = 0$

$$x = \frac{5 \pm \sqrt{5^2 - 4(3)(-7)}}{2(3)} = \frac{5 \pm \sqrt{109}}{6}$$ $\sqrt{109}$ *does not come out even, no perfect square #s*

separate the answers: $X = \frac{5+\sqrt{109}}{6}, \frac{5-\sqrt{109}}{6}$

7) Use the quadratic formula to solve the equation.

$3x^2 - 2x + 5 = 10x + 1$ put in order $ax^2 + bx + c = 0$

$-10x \ -1$

$3x^2 - 12x + 4 = 0$ $a = 3$ $b = -12$ $c = 4$

$$x = \frac{12 \pm \sqrt{12^2 - 4(3)(4)}}{2(3)} = \frac{12 \pm \sqrt{96}}{6}$$ $\sqrt{96}$ *does not come out even, but 16 goes into 96*

$16 \cdot 6$

$\frac{12 \pm \sqrt{96}}{6} = \frac{12 \pm 4\sqrt{6}}{6}$ reduce $= \frac{6 \pm 2\sqrt{96}}{3}$

8) Use the quadratic formula to solve the equation.

$7x^2 - 2x + 21 = 26x + 1$ put in order $ax^2 + bx + c = 0$

$-26x \ -1$

$7x^2 - 28x + 20 = 0$

$x = \frac{28 \pm \sqrt{28^2 - 4(7)(20)}}{2(7)} = \frac{28 \pm \sqrt{224}}{14}$ $\sqrt{224}$ *does not come out even, but 16 goes into 224*

$16 \cdot 14$

$\frac{28 \pm \sqrt{224}}{14} = \frac{28 \pm 4\sqrt{14}}{14}$ reduce = $\frac{14 \pm 2\sqrt{96}}{7}$

9) Solve.

$3x^2 - 33 = 0$ a = 3 b = 0 c = -33

$x = \frac{0 \pm \sqrt{0 - 4(3)(-33)}}{2(3)} = \frac{12 \pm \sqrt{396}}{6}$ $\sqrt{396}$ *does not come out even, but 36 goes into it*

$36 \cdot 11$

$\frac{0 \pm \sqrt{396}}{6} = \frac{\pm 6\sqrt{11}}{6}$ reduce = $\pm\sqrt{11}$ separate the answers: $\sqrt{11}, -\sqrt{11}$

10) Use the quadratic formula to solve the equation.

$2x^2 - 13x = 1$ put in order $ax^2 + bx + c = 0$

$2x^2 - 13x - 1 = 0$

$x = \frac{13 \pm \sqrt{13^2 - 4(2)(-1)}}{2(2)} = \frac{13 \pm \sqrt{177}}{4}$ $\sqrt{177}$ *does not come out even, no perfect square #s*

separate the answers: $X = \frac{13 + \sqrt{177}}{4}, \frac{13 - \sqrt{177}}{4}$

11) Solve the equation using the quadratic formula.

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

$x = \frac{-6 \pm \sqrt{6^2 - 4(1)(-2)}}{2(1)} = \frac{-6 \pm \sqrt{44}}{2}$ $\sqrt{44}$ *does not come out even, but* 4 *goes into it*

$4 \cdot 11$

$\frac{-6 \pm \sqrt{44}}{2} = \frac{-6 \pm 2\sqrt{11}}{2}$ reduce = $-3 \pm \sqrt{11}$

separate the answers: $-3 + \sqrt{11}, -3 - \sqrt{11}$

12) Solve the following quadratic equation by using the quadratic formula.

$4x^2 + 6x = 5$ put in order $ax^2 + bx + c = 0$

-5

$4x^2 + 6x - 5 = 0$

$x = \frac{-6 \pm \sqrt{6^2 - 4(4)(-5)}}{2(4)} = \frac{-6 \pm \sqrt{116}}{8}$ $\sqrt{116}$ *does not come out even, but* 4 *goes into it*

$4 \cdot 29$

$\frac{-6 \pm \sqrt{116}}{8} = \frac{-6 \pm 2\sqrt{11}}{8}$ reduce = $\frac{-3 \pm \sqrt{96}}{4}$

separate the answers: $X = \frac{-3+\sqrt{96}}{4}, \frac{-3-\sqrt{96}}{4}$

13) Find the zero(s) of the following function.

$f(x) = x^2 - 14x - 4$

$x = \frac{14 \pm \sqrt{14^2 - 4(1)(-4)}}{2(1)} = \frac{14 \pm \sqrt{212}}{2}$ $\sqrt{212}$ *does not come out even, but* 4 *goes into it*

$4 \cdot 53$

$\frac{14 \pm \sqrt{212}}{2} = \frac{14 \pm 2\sqrt{53}}{2}$ reduce = $7 \pm \sqrt{53}$

separate the answers: $7 + \sqrt{53}, 7 - \sqrt{53}$

14) Find the zeros of the function. Give exact answers and approximate solutions rounded to three decimal places when possible.

$x^2 + 7x - 5 = 0$

$x = \frac{-7 \pm \sqrt{7^2 - 4(1)(-5)}}{2(1)} = \frac{-7 \pm \sqrt{69}}{2}$ $\sqrt{69}$ *does not come out even, no perfect square #s*

separate the answers: $X = \frac{-7+\sqrt{69}}{2}, \frac{-7-\sqrt{69}}{2}$

15) Find the zeros of the function. Give exact answers and approximate solutions rounded to three decimal places when possible.

$5x^2 - 3x - 7 = 0$

$x = \frac{3 \pm \sqrt{3^2 - 4(5)(-7)}}{2(5)} = \frac{3 \pm \sqrt{149}}{10}$ $\sqrt{149}$ *does not come out even, no perfect square #s*

separate the answers: $X = \frac{3+\sqrt{149}}{10}, \frac{3-\sqrt{149}}{10}$

16) Find the zeros of the function.

$f(x) = 3x^2 - 7x - 11$

$x = \frac{7 \pm \sqrt{7^2 - 4(3)(-11)}}{2(3)} = \frac{7 \pm \sqrt{181}}{6}$ $\sqrt{181}$ *does not come out even, no perfect square #s*

separate the answers: $X = \frac{7+\sqrt{181}}{6}, \frac{7-\sqrt{181}}{6}$

17) Find the zero(s) of the following function.

$f(x) = x^2 - 6x - 4$

$x = \frac{6 \pm \sqrt{6^2 - 4(1)(-4)}}{2(1)} = \frac{6 \pm \sqrt{52}}{2}$ $\sqrt{52}$ *does not come out even, but* 4 *goes into it*

$4 \cdot 13$

$\frac{6 \pm \sqrt{52}}{2} = \frac{6 \pm 2\sqrt{13}}{2}$ reduce = $3 \pm \sqrt{13}$

separate the answers: $3 + \sqrt{13}, 3 - \sqrt{13}$

18) Solve the following quadratic equation by using the quadratic formula.

$14x^2 + 14x = 5$ put in order $ax^2 + bx + c = 0$

-5

$14x^2 + 14x - 5 = 0$

$x = \frac{-14 \pm \sqrt{14^2 - 4(14)(-5)}}{2(14)} = \frac{-14 \pm \sqrt{476}}{28}$ $\sqrt{476}$ *does not come out even, but* 4 *goes into it*

$4 \cdot 119$

$\frac{-14 \pm \sqrt{476}}{28} = \frac{-14 \pm 2\sqrt{119}}{28}$ reduce = $\frac{-7 \pm \sqrt{119}}{14}$

separate the answers: X = $\frac{-7 + \sqrt{119}}{14}, \frac{-7 - \sqrt{119}}{14}$

19) Use the quadratic formula to solve the equation.

$2x^2 - 1 = 11x$ put in order $ax^2 + bx + c = 0$

$-11x$

$2x^2 - 11x - 1 = 0$

$x = \frac{11 \pm \sqrt{11^2 - 4(2)(-1)}}{2(2)} = \frac{11 \pm \sqrt{129}}{4}$ $\sqrt{129}$ *does not come out even, no perfect square #s*

separate the answers: X = $\frac{-11 + \sqrt{129}}{4}, \frac{11 - \sqrt{129}}{4}$

20) Solve the equation using the quadratic formula.

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

$x = \frac{-6 \pm \sqrt{6^2 - 4(1)(-2)}}{2(1)} = \frac{-6 \pm \sqrt{44}}{2}$ $\sqrt{52}$ *does not come out even, but* 4 *goes into it*

$4 \cdot 11$

$\frac{6 \pm \sqrt{44}}{2} = \frac{-6 \pm 2\sqrt{11}}{2}$ reduce = $-3 \pm \sqrt{11}$

separate the answers: $-3 + \sqrt{11}, -3 - \sqrt{11}$