UNIT 12 Quadratic Functions

REVIEW

$$x = \frac{-b}{2a}$$

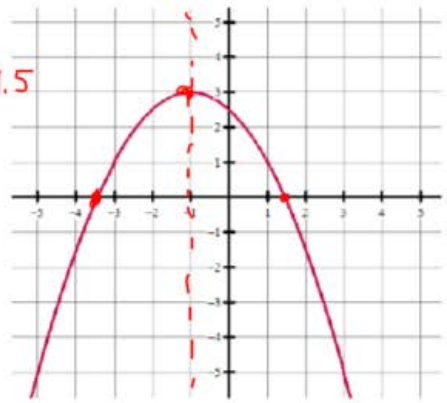
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

NAME:_____

DATE:_____

Find the roots, axis of symmetry, and vertex of the following.

1.

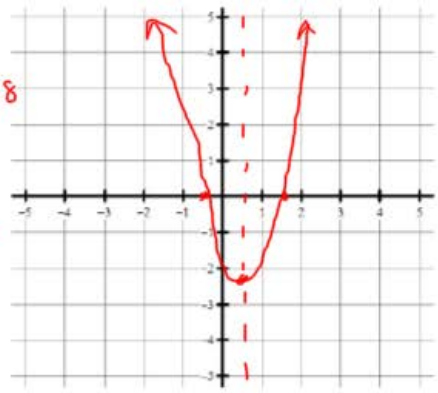


Roots: -3.5 and 1.5

Axis of Symmetry: $x = -1$

Vertex: $(-1, 3)$

2. $y = 2x^2 - 3x - 1$



Roots: -0.28 and 1.78

Axis of Symmetry: $x = \frac{-(-3)}{2(2)} = \frac{3}{4} = 0.75$

Vertex: $(0.75, -2.125)$

Solve each quadratic using the method given. Express your answer as a decimal. (rounded to hundredth)

3. GRAPHING

$$0 = -\frac{3}{4}x^2 - 8x - 1$$

$y = -\frac{3}{4}x^2 - 8x - 1$

$x = -10.54$ and -0.13

4. Using SQUARE ROOTS

$$3m^2 - 5 = 19$$

$+5 \quad +5$

$\frac{3m^2}{3} = \frac{24}{3}$

$\sqrt{m^2} = \sqrt{8}$

$m = \pm\sqrt{8}$

$m = \pm 2.83$

5. QUADRATIC FORMULA

$$10 = 3p^2 - 5p - 8$$

$-10 \quad -10$

$0 = 3p^2 - 5p - 18$

$a = 3$, $b = -5$, $c = -18$

$p = \frac{5 \pm \sqrt{(-5)^2 - 4(3)(-18)}}{2(3)}$

$p = \frac{5 \pm \sqrt{241}}{6}$

$p = 3.42$ and -1.75

Solve each quadratic using any method you want. Express your answer in simplest radical form.

6. $4t^2 - 12t - 21 = -9$

$+9 \quad +9$

$4t^2 - 12t - 12 = 0$

$a = 4$, $b = -12$, $c = -12$

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

$t = \frac{12 \pm \sqrt{336}}{8} = \frac{12 \pm \sqrt{16} \cdot \sqrt{21}}{8}$

$\frac{12 \pm 4\sqrt{21}}{8} = \frac{12}{8} \pm \frac{4\sqrt{21}}{8} = \frac{3}{2} \pm \frac{\sqrt{21}}{2}$

7. $2n = 3n^2 + 6n + 12$

$-2n \quad -2n$

$0 = 3n^2 + 4n + 12$

$a = 3$, $b = 4$, $c = 12$

$n = \frac{-4 \pm \sqrt{4^2 - 4(3)(12)}}{2(3)}$

$n = \frac{-4 \pm \sqrt{-128}}{6}$

NO SOLUTION

8. $8 = \frac{d^2}{3} - 1$

$+1 \quad +1$

$3 \cdot 9 = \frac{d^2}{3} \cdot 3$

$\sqrt{27} = \sqrt{d^2}$

$\pm\sqrt{27} = d$

$d = \pm\sqrt{9} \cdot \sqrt{3}$

$d = \pm 3\sqrt{3}$

9. Find the zeros of $f(x) = 2x^2 - 3x - 12$

$0 = 2x^2 - 3x - 12$

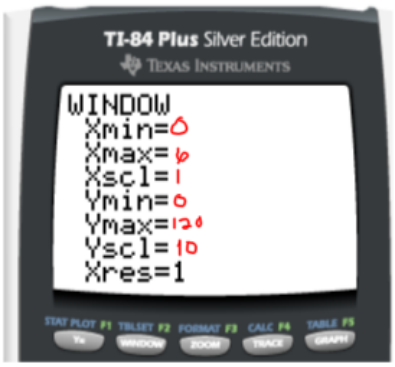
$x = -1.81$ and 3.31

I used graphing, but you could use quadratic formula if you like.

APPLICATION

10. Mr. Kelly shoots a bottle rocket into the air. The function shows the height of the rocket over time.
$s(t) = -16t^2 + 82t + 3$ where t is time in seconds and s is height of the rocket in feet

a. Graph with a "friendly" window. Record window here. →



b. Fill in the table.

t	s(t)
2	103
5	13
0.5 and 4.625	40

$40 = -16t^2 + 82t + 3$
$-40 \quad -40$
$0 = -16t^2 + 82t - 37$
$a = -16$
$b = 82$
$c = -37$
$t = \frac{-82 \pm \sqrt{82^2 - 4(-16)(-37)}}{2(-16)}$
$t = \frac{-82 \pm \sqrt{4356}}{-32}$

c. What is the maximum height of the rocket?

vertex $x = \frac{-b}{2a} = \frac{-82}{2(-16)} = \frac{-82}{-32} = 2.5625$

(2.5625, 108.06)

$-16(2.5625)^2 + 82(2.5625) + 3$

108.06 ft

d. When will the rocket hit the ground?

You can graph to answer these!

$0 = -16t^2 + 82t + 3$
$a = -16$, $b = 82$, $c = 3$
$t = \frac{-82 \pm \sqrt{82^2 - 4(-16)(3)}}{2(-16)} = \frac{-82 \pm \sqrt{6916}}{-32} = -0.06$ and 5.16 seconds

doesn't make sense

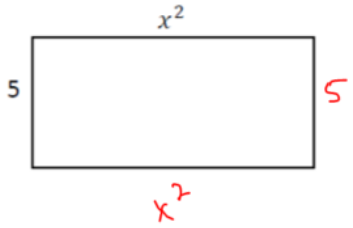
e. What does $s(3)$ mean? Find it!

Height of the rocket at 3 seconds.

$s(3) = -16(3)^2 + 82(3) + 3$
$s(3) = 105$

105 ft

11. The rectangle has a **PERIMETER** of 140 inches.



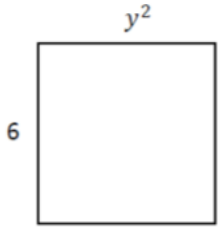
a. Write an equation to represent this.

$5 + x^2 + 5 + x^2 = 140$
$2x^2 + 10 = 140$
$-10 \quad -10$

b. Solve for x.

$\frac{2x^2}{2} = \frac{130}{2}$
$\sqrt{x^2} = \sqrt{65}$
$x \approx \pm 8.06$

12. The rectangle has an **AREA** of 240 in^2.



a. Write an equation to represent this.

$6y^2 = 240$

b. Solve for y.

$\frac{6y^2}{6} = \frac{240}{6}$
$\sqrt{y^2} = \sqrt{40}$
$y = \pm 6.33$