Algebra 1

Ch. 8 Review

Name: Key

For questions #1-2, tell whether the function is quadratic. Explain. (8-1)

1.

x	−6	−4	−2	0	2
y	−5	−6	−4	2	11

−1 +2 +6 +9

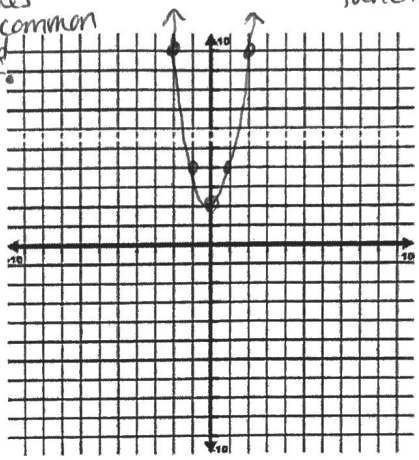
not a quadratic function b/c y values don't have common 2nd diff.

2. $3x^2 - 4 = y + x$

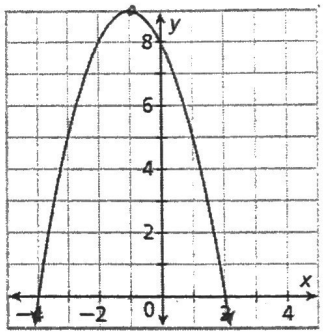
→ yes it is a quadratic function; "U" shape

3. Graph $y - 2 = x^2$ using a table of values (8-1)

x	y
−2	10
−1	4
0	2
1	4
2	10



4. Given the graph to the right, find the zero(s), axis of symmetry, and vertex. Tell whether the vertex is a minimum or a maximum. Then give the domain and range. (8-2)



Zero(s) -4 & 2

Axis of symmetry $x = -1$

Vertex $(-1, 9)$ Minimum or (Maximum)

D: $\mathbb{R}$ R: $y \leq 9$

5. Given the equation below, find the zero(s), axis of symmetry, and vertex. Tell whether the vertex is a minimum or a maximum. Then give the domain and range. (8-2)

$f(x) = 2x^2 - 14x + 20$

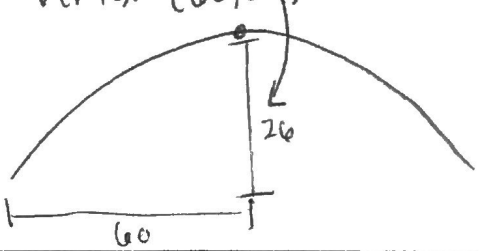
Zero(s) 2 & 5

Axis of symmetry $x = 3.5$

Vertex $(3.5, -4.5)$ (Minimum) or Maximum

D: $\mathbb{R}$ R: $y \geq -4.5$

5. The height above water level of a curved arch support for a bridge can be modeled by $f(x) = -0.007x^2 + 0.84x + 0.8$, where x is the distance in feet from where the arch support enters the water. Can a sailboat that is 30 feet tall pass under the bridge? Explain. (8-2)



No, the arch is only 26 ft. tall; the sail boat is too tall!

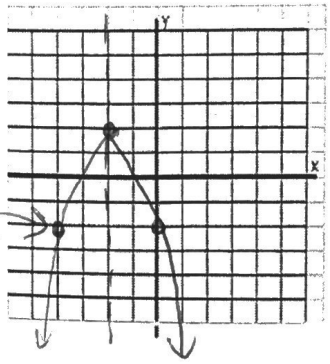
6. Graph the quadratic function $y = -x^2 - 4x - 2$ using the vertex, axis of symmetry, y-intercept, and matching point. Don't forget to graph the axis of symmetry. (8-3)

V: (-2, 2)

a.o.s.: x = -2

y-intercept: (0, -2)

Matching point: (-4, -2)



7. The height in feet of a soccer ball that is kicked can be modeled by the function $f(x) = -8x^2 + 24x$, where x is the time in seconds after it is kicked. Find the soccer ball's maximum height and the time it takes the ball to reach this height. Then find how long the soccer ball is in the air. (8-3)

Max Ht: 18 ft. Time it take to reach Max Ht: 1.5 sec. Length of time in air: 3 sec.

8. Compare the graphs below to the parent function of $f(x) = x^2$. What transformations took place? Don't forget to give the direction of the parabola. (8-4)

a) $g(x) = \frac{5}{3}x^2$ $a > 1$ vertical stretch

b) $h(x) = -2x^2 - 7$ $a > 1$ opens down, vertical stretch, moves down 7

c) $f(x) = \frac{1}{4}(x-1)^2 + 3$ $0 < a < 1$ vertical compression, moves right 1, moves up 3

9. Compare the widths of the graphs of the given quadratic functions. Order them most stretched to most compressed. (8-4)

$g(x) = \frac{5}{3}x^2$ $a = 1.\overline{6}$ $h(x) = -2x^2 - 7$ $a = 2$ $f(x) = \frac{1}{4}(x-1)^2 + 3$ $a = \frac{1}{4}$ h(x), g(x), f(x)

10. Solve the quadratic equation by graphing. (8-5)

a) $40 = x^2 + 3x$ x = -8, x = 5

b) $4x^2 - 4x + 1 = 0$ x = .5

c) $\frac{1}{2}x^2 - 12x + 10 = 2 - 12x$ no solution

11. A rocket is launched in the air. The quadratic function $h = -5t^2 + 110t$ models the height of the rocket after t seconds. About how long was the rocket in the air? (8-5)

22 sec.

12. Solve each quadratic equation using square roots. (8-7)

a) $10 - 2x^2 = -64$

$-10 \quad -10$

$\frac{-2x^2}{-2} = \frac{-74}{-2}$

$\sqrt{x^2} = \sqrt{37}$

$x = \pm 6.08$

b) $3x^2 - 84 = 0$

$+84 \quad +84$

$\frac{3x^2}{3} = \frac{84}{3}$

$\sqrt{x^2} = \sqrt{28}$

$x = \pm 5.29$ or $2\sqrt{7}$

BONUS: $\pm 2\sqrt{7}$

c) $(2x-1)^2 - 4 = 60$

$+4 \quad +4$

$\sqrt{(2x-1)^2} = \sqrt{64}$

$2x - 1 = \pm 8$

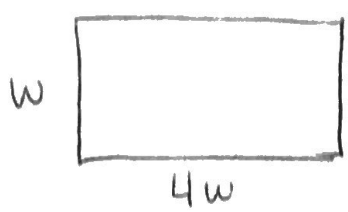
$2x - 1 = 8$ $\quad +1 \quad +1$ $\quad \frac{2x}{2} = \frac{9}{2}$ $\quad x = 4.5$

$2x - 1 = -8$ $\quad +1 \quad +1$ $\quad \frac{2x}{2} = \frac{-7}{2}$ $\quad x = -3.5$

d) $\sqrt{(x+9)^2} = \sqrt{-25}$

no solution! can't take the square root of a negative number!

13. The length of a rectangle is 4 times its width. The area of the rectangle is 225 square meters. Find the dimensions of the rectangle. Round to the nearest tenth of a meter. (8-7)



$A = l \cdot w$

$225 = 4w \cdot w$

$\frac{225}{4} = \frac{4w^2}{4}$

$\sqrt{56.25} = \sqrt{w^2}$

$w = 7.5$m

$l = 4w$

$l = 4(7.5)$

$l = 30$m

14. Solve each quadratic equation by factoring. (8-6)

a) $3x^2 - 4x + 1 = 0$

3 mult. / −4 add

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

$x - 1 = 0$, $+1\ +1$ → **$x = 1$**

$3x - 1 = 0$, $+1\ +1$, $\frac{3x}{3} = \frac{1}{3}$ → **$x = \frac{1}{3}$**

b) $x^2 + 36 = 12x$

$-12x \quad -12x$

$x^2 - 12x + 36 = 0$

add mult.

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

$x - 6 = 0$, $+6\ +6$ → **$x = 6$**

$x - 6 = 0$, $+6\ +6$ → **$x = 6$**

Double root!

c) $2x^2 + 6x = -18$

$+18 \quad +18$

$\frac{2x^2}{2} + \frac{6x}{2} + \frac{18}{2} = 0$

$2(x^2 + 3x + 9) = 0$

add mult.

Can't factor!

if you graph it, you can see it is no solution!

d) $4x^2 - 81 = 0$

$(2x-9)(2x+9) = 0$

$2x - 9 = 0$, $+9\ +9$, $\frac{2x}{2} = \frac{9}{2}$ → **$x = 4.5$**

$2x + 9 = 0$, $-9\ -9$, $\frac{2x}{2} = \frac{-9}{2}$ → **$x = -4.5$**

e) $4x^2 - 24x = 0$

$4x(x-6) = 0$

$\frac{4x}{4} = \frac{0}{4}$ → **$x = 0$**

$x - 6 = 0$, $+6\ +6$ → **$x = 6$**

15. Solve the quadratic equation by completing the square. (8-8)

a) $x^2 + 2x = -3$

$x^2 + 2x + \underline{1} = -3 + \underline{1}$

$\left(\frac{2}{2}\right)^2$

$\sqrt{(x+1)^2} = \sqrt{-2}$

No solution!

Can't square root a negative number!

b) $x^2 = 2x + 6$

$-2x \quad -2x$

$x^2 - 2x + \underline{1} = 6 + \underline{1}$

$\left(\frac{2}{2}\right)^2$

$\sqrt{(x-1)^2} = \sqrt{7}$

$x - 1 = \pm\sqrt{7}$

$+1 \quad +1$

$x = 1 \pm \sqrt{7}$

c) $x^2 - 12x + 36 = 0$

$-36 \quad -36$

$x^2 - 12x + \underline{36} = -36 + \underline{36}$

$\left(\frac{12}{2}\right)^2$

$\sqrt{(x-6)^2} = \sqrt{0}$

$x - 6 = \pm 0$

$+6 \quad +6$

$x = 6$ → Double Root!

16. Solve the quadratic equations by using the quadratic formula. (8-9)

a) $x^2 + 2x = -3$

$+3 \quad +3$

$\underset{a}{x^2} + \underset{b}{2x} + \underset{c}{3} = 0$

$a = 1$, $b = 2$, $c = 3$

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

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

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

No solution!

Can't take the square root of a negative number!

b) $x^2 = 2x + 6$

$-x^2 \quad -x^2$

$0 = \underset{a}{-x^2} + \underset{b}{2x} + \underset{c}{6}$

$a = -1$, $b = 2$, $c = 6$

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

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

$x = \frac{-2 \pm \sqrt{28}}{-2}$ → $2\sqrt{4 \cdot 7}$

$x = \frac{-2 \pm 2\sqrt{7}}{-2}$

$x = 1 \pm \sqrt{7}$

c) $\underset{a}{x^2} \underset{b}{-12x} + \underset{c}{36} = 0$

$a = 1$, $b = -12$, $c = 36$

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

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

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

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

$x = \frac{12 + 0}{2} = \frac{12}{2}$ → **$x = 6$**

$x = \frac{12 - 0}{2} = \frac{12}{2}$ → **$x = 6$**

Double root!

17. Tell how many solutions the quadratic equation has, by **finding the discriminant**. (8-9)

b^2-4ac → if $b^2-4ac<0$ NO sol.
$b^2-4ac=0$ 1 sol.
$b^2-4ac>0$ 2 sol.

a) $5x^2+3x=-4$
$+4\ +4$
$5x^2+3x+4=0$
$a\ \ b\ \ c$
b^2-4ac
$(3)^2-4(5)(4)$
-71 = neg. #
No solution!

b) $2x^2-11x+6=0$
$a\ \ b\ \ c$
b^2-4ac
$(-11)^2-4(2)(6)$
73 = pos. #
2 real solutions!

c) $-3x^2=6x-3$
$+3x^2\ +3x^2$
$0=3x^2+6x-3$
b^2-4ac
$(6)^2-4(3)(-3)$
72 = pos #
2 real solutions!

18. Answer question number 5, but using the discriminant this time. (8-9)

$h=-.007x^2+.84x+.8$
Ht. of sail boat! → $30=-.007x^2+.84x+.8$
$-30\qquad\qquad -30$
$0=\underset{a}{-.007}x^2+\underset{b}{.84}x\underset{c}{-29.2}$

b^2-4ac
$(.84)^2-4(-.007)(-29.2)$
$-.112$ = neg. #
no solution!

No, the sailboat will not fit!

19. Solve the system of nonlinear equations by the substitution process, and check your answer by graphing it on desmos.

a) ① $\begin{cases} y=x^2+7x+12 \\ 3x-y=5 \end{cases}$

② $3x-(x^2+7x+12)=5$
$3x-x^2-7x-12=5$
$-x^2-4x-12=5$
$-5\ \ -5$
③ $-x^2-4x-17=0$
$\frac{}{-1}\ \frac{}{-1}\ \frac{}{-1}\ \frac{}{-1}$ → $x^2+4x+17=0$
$a\ \ b\ \ c$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$
$x=\frac{-(4)\pm\sqrt{(4)^2-4(1)(17)}}{2(1)}$
$x=\frac{-4\pm\sqrt{-52}}{2}$
No solution!
Can't take square root of neg. number!

b) ① $\begin{cases} y=2x^2-8x+3 \\ y=6x-21 \end{cases}$

② $2x^2-8x+3=6x-21$
$-6x+21\ \ -6x+21$
$\frac{2x^2-14x+24=0}{2\ \ 2\ \ 2\ \ 2}$
③ $x^2-7x+12=0$
add mult.
$(x-4)(x-3)=0$
$x-4=0$ $x-3=0$
$+4\ +4$ $+3\ +3$
$x=4$ $x=3$

④ $x=4$: $y=6x-21$, $y=6(4)-21$, $y=3$
$x=3$: $y=6x-21$, $y=6(3)-21$, $y=-3$

⑤ (4, 3)
(3, −3)

20) Name all of the methods we can use to solve quadratic equations.

- Quadratic Formula
- Factoring
- Graphing (DESMOS)
- Completing the Square
- Taking Square Roots