

Period

Name

Date

8.2

Quadratic Functions

Find the axis of symmetry and vertex.

1) $y = 4x^2 - 2$ $ax^2 + bx + c$
 $a = 4$ $b = 0$ $c = -2$

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

$$\frac{-(0)}{2(4)}$$

$$\frac{0}{8} = 0$$

$$x = 0$$

axis of symmetry.

$$\text{vertex } (0, -2)$$

vertex

$$y = 4x^2 - 2$$

$$y = 4(0)^2 - 2$$

$$y = 0 - 2$$

$$y = -2$$

$a = 4$ I opened up
minimum at -2

2) $y = -x^2 + 4x - 6$ $a = -1$ $b = 4$ $c = -6$

Axis of symmetry $x = \frac{-b}{2a} = \frac{-(4)}{2(-1)} = \frac{-4}{-2} = 2$

vertex

$$y = -x^2 + 4x - 6$$

$$y = -(2)^2 + 4(2) - 6$$

$$y = -4 + 8 - 6$$

$$y = -2$$

$$\text{vertex } (2, -2)$$

axis of symmetry $x = 2$

$$3) y = x^2 + 4x + 5 \quad a=1 \quad b=4 \quad c=5$$

$$\text{axis of symmetry } x = \frac{-b}{2a} = \frac{-(4)}{2(1)} = \frac{-4}{2} = (-2)$$

vertex

$$y = x^2 + 4x + 5$$

$$y = (-2)^2 + 4(-2) + 5$$

$$y = 4 - 8 + 5$$

$$y = 9 - 8$$

$$y = 1$$

vertex $(-2, 1)$

axis of symmetry $x = -2$

$$4) y = x^2 - 8x + 12 \quad a=1 \quad b=-8 \quad c=12$$

$$\text{axis of symmetry } \frac{-b}{2a} = \frac{-(-8)}{2(1)} = \frac{8}{2} = 4$$

vertex

$$y = x^2 - 8x + 12$$

$$y = (4)^2 - 8(4) + 12$$

$$y = 16 - 32 + 12$$

$$y = -16 + 12$$

$$y = -4$$

vertex $(4, -4)$

axis of symmetry $x = 4$

7) $y = 2x^2 + x - 4$ $a = 2$ $b = 1$ $c = -4$

axis of symmetry $\frac{-b}{2a}$ $\frac{-(1)}{2(2)}$

$\frac{-1}{4}$

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

vertex

$(-0.25, -4.125)$

$y = 2\left(\frac{1}{4}\right)^2 + \frac{1}{4} - 4$

$y = 2\left(\frac{1}{16}\right) + \frac{1}{4} - 4$

axis of symmetry

$x = -\frac{1}{4}$

$y = \frac{2}{16} + \frac{1}{4} - 4$

$x = -0.25$

$y = \frac{2}{16} + -4\frac{1}{4}$

$y = -4.125$

8) $y = -6x^2 - 8x + 10$ $a = -6$ $b = -8$ $c = 10$

axis of symmetry $x = \frac{-b}{2a}$ $\frac{-(-8)}{2(-6)}$ $\frac{8}{-12} = -\frac{2}{3}$

vertex $y = -6x^2 - 8x + 10$

$y = -6\left(-\frac{2}{3}\right)^2 - 8\left(-\frac{2}{3}\right) + 10$

$y = -6\left(\frac{4}{9}\right) + \frac{16}{3} + 10$

$y = \frac{-24}{9} + \frac{16}{3} + 10$

$y = 12\frac{2}{3}$
 $y = 12.66$

vertex $\left(-\frac{2}{3}, 12\frac{2}{3}\right)$

axis of symmetry $x = -\frac{2}{3}$

$$5) y = -6x^2 + 3$$

$$a = -6 \quad b = 0 \quad c = 3$$

$$\text{axis of symmetry } x = \frac{-b}{2a} = \frac{-(0)}{2(-6)} = \frac{0}{-12} = \textcircled{0}$$

vertex

$$y = -6x^2 + 3$$

$$y = -6(0)^2 + 3$$

$$y = 0 + 3$$

$$y = 3$$

Vertex (0, 3)

axis of symmetry $x = 0$

$$6) y = -3x^2 + 12x - 7$$

$$a = -3 \quad b = 12 \quad c = -7$$

$$\text{axis of symmetry } x = \frac{-b}{2a} = \frac{-(12)}{2(-3)} = \frac{-12}{-6} = \textcircled{2}$$

vertex

$$y = -3x^2 + 12x - 7$$

$$y = -3(2)^2 + 12(2) - 7$$

$$y = -3(4) + 24 - 7$$

$$y = -12 + 24 - 7$$

$$y = 12 - 7$$

$$y = 5$$

Vertex (2, 5)

axis of symmetry $x = 2$

$$9) f(x) = x^2 - 2x - 1$$

$$x = \frac{-b}{2a} = \frac{-(-2)}{2(1)} = \frac{2}{2} = \boxed{1}$$

vertex $f(x) = x^2 - 2x - 1$

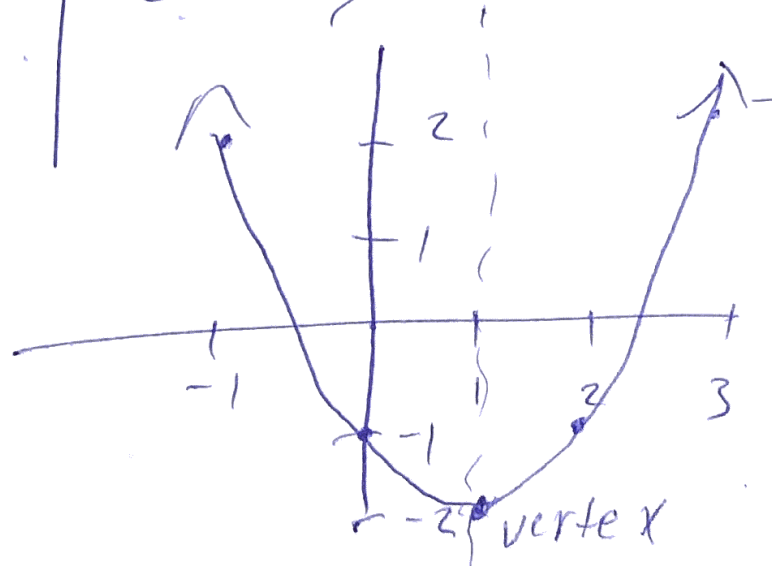
$$f(x) = (1)^2 - 2(1) - 1$$

$$f(x) = 1 - 2 - 1$$

$$f(x) = -2$$

vertex (1, -2)

x	$x^2 - 2x - 1$	y
-1	$(-1)^2 - 2(-1) - 1$ 1 + 2 - 1 3 - 1	2
0	$(0)^2 - 2(0) - 1$ 0 - 1	-1
1	$(1)^2 - 2(1) - 1$ 1 - 2 - 1	-2
2	$(2)^2 - 2(2) - 1$ 4 - 4 - 1	-1
3	$(3)^2 - 2(3) - 1$ 9 - 6 - 1	2



10) $y = 2x^2 + 1$ $a = 2$ $b = 0$ $c = 1$

$x = \frac{-b}{2a} = \frac{-(0)}{2(2)} = \frac{0}{4} = \boxed{0}$ $x = 0$

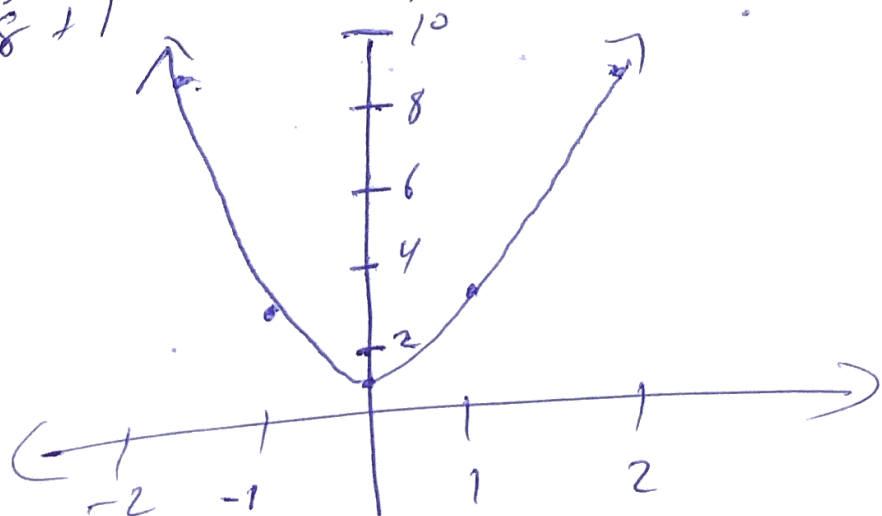
vertex x $y = 2x^2 + 1$ vertex $(0, 1)$

$y = 2(0)^2 + 1$

$y = 0 + 1$

$y = 1$

x	$2x^2 + 1$	y
-2	$2(-2)^2 + 1$ $8 + 1$	9
-1	$2(-1)^2 + 1$ $2 + 1$	3
0	$2(0)^2 + 1$ $0 + 1$	1
1	$2(1)^2 + 1$ $2 + 1$	3
2	$2(2)^2 + 1$ $8 + 1$	9



$$12.) f(x) = \frac{1}{2}x^2 + 12x + 11$$

axis of symmetry $a = \frac{1}{2}$ $b = 12$ $c = 11$

$$x = \frac{-b}{2a} = \frac{-(12)}{2(\frac{1}{2})} = \frac{-12}{1} = -12$$

$$y = \frac{1}{2}x^2 + 12x + 11$$

$$y = \frac{1}{2}(-12)^2 + 12(-12) + 11$$

$$y = \frac{1}{2}(144) + -144 + 11$$

$$y = 72 - 144 + 11$$

$$y = -72 + 11$$

$$y = -61$$

$$(-12, -61)$$

13.)

$$f(x) = -\frac{3}{4}x^2 + 2x + 3$$

$$a = -\frac{3}{4} \quad b = 2 \quad c = 3$$

$$x = \frac{-b}{2a} = \frac{-(2)}{2(-\frac{3}{4})} = \frac{-2}{-\frac{6}{4}} = \frac{-2}{-\frac{3}{2}} = 1\frac{1}{3} = \frac{4}{3}$$

$$f(x) = -\frac{3}{4}x^2 + 2x + 3$$

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

$$f(x) = -\frac{3}{4}\left(\frac{16}{9}\right) + \frac{8}{3} + 3$$

$$f(x) = -\frac{4}{3} + \frac{8}{3} + 3$$

$$f(x) = \frac{4}{3} + 3 = 1\frac{1}{3} + 3 = 4\frac{1}{3}$$

$$\left(\frac{4}{3}, \frac{13}{3}\right)$$

$$\left(\frac{4}{3}, 4\frac{1}{3}\right)$$

$$4\frac{1}{3}$$