Solution *Section* 1.3 – Quadratic Functions

Exercise

For the function $f(x) = x^2 + 6x + 3$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

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

$y = f(-3) = (-3)^2 + 6(-3) + 3 = -6$ ***Vertex point*** $(-3, -6)$

b) Line of *symmetry*: $x = -3$

c) *Minimum* point, value $(-3, -6)$

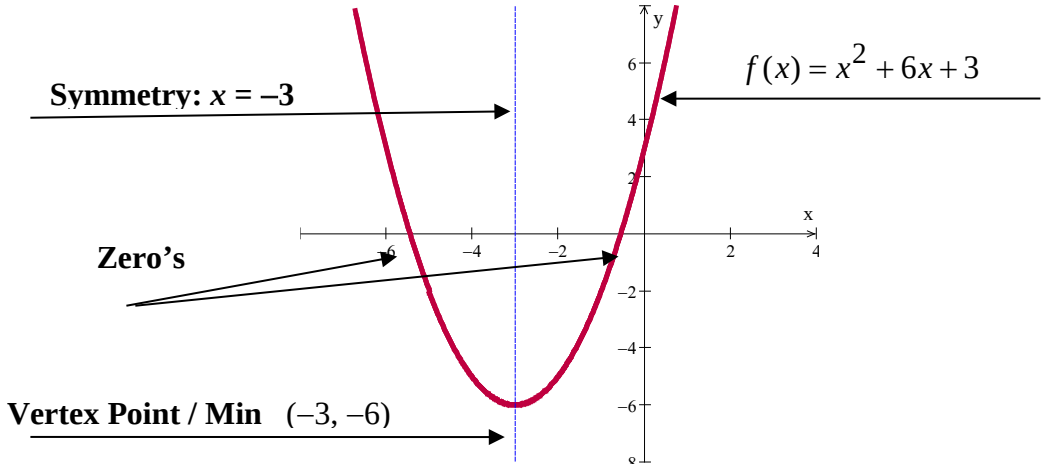
d) $x = \frac{-6 \pm \sqrt{36 - 12}}{2} = \frac{-6 \pm \sqrt{24}}{2} = \frac{-6 \pm 2\sqrt{6}}{2} = -3 \pm \sqrt{6}$

$$x = \begin{cases} -3 + \sqrt{6} = -0.5 \\ -3 - \sqrt{6} = -5.45 \end{cases}$$

e) *y*-intercept $y = 3$

f) *Range*: $[-6, \infty)$ *Domain*: $(-\infty, \infty)$

g)



h) *Decreasing*: $(-\infty, -3)$ *Increasing*: $(-3, \infty)$

Exercise

For the function $f(x) = x^2 + 6x + 5$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = -\frac{6}{2}$ $\qquad x = -\frac{b}{2a}$

$= -3$

$y = f(-3) = (-3)^2 + 6(-3) + 5$

$= -4$

Vertex point: $(-3, -4)$

b) Axis of *symmetry*: $x = -3$

c) *Minimum* point @ $(-3, -4)$

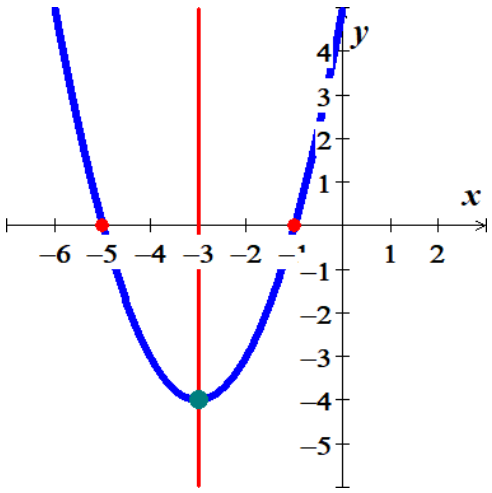
d) $x^2 + 6x + 5 = 0$

$x = -5, \ -1$

e) $x = 0 \ \rightarrow \ y = 5$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $[-4, \infty)$

g)



h) *Increasing:* $(-3, \infty)$ $\qquad$ Decreasing: $(-\infty, -3)$

Exercise

For the function $f(x) = -x^2 - 6x - 5$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = -\frac{-6}{-2}$ $\qquad x = -\frac{b}{2a}$

$= -3$

$y = f(-3) = -9 + 18 - 5$

$= 4$

Vertex point: $(-3,\ 4)$

b) Axis of *symmetry*: $x = -3$

c) *Maximum* point @ $(-3,\ 4)$

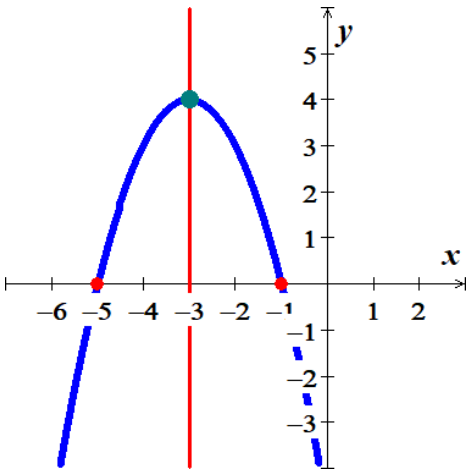
d) $-\left(x^2 + 6x + 5\right) = 0$

$x = -5,\ -1$

e) $x = 0 \rightarrow y = -5$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $(-\infty,\ 4]$

g)



h) *Increasing:* $(-\infty,\ -3)$ $\qquad$ *Decreasing*: $(-3,\ \infty)$

Exercise

For the function $f(x) = x^2 - 4x + 2$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = -\frac{-4}{2}$ $\qquad x = -\frac{b}{2a}$

$= 2$

$f(2) = 4 - 8 + 2$

$= -2$

Vertex point: $(2,\ -2)$

b) Axis of *symmetry*: $x = 2$

c) *Minimum* point @ $(2,\ -2)$

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

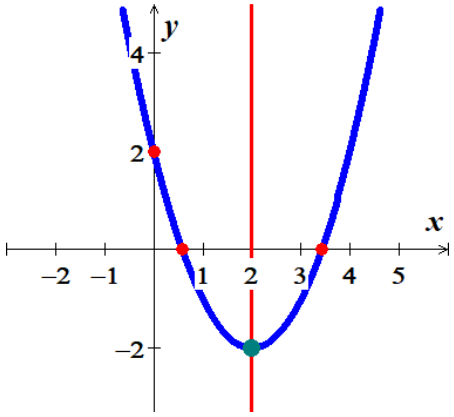
$x = \frac{4 \pm \sqrt{8}}{2}$

$x = 2 \pm \sqrt{2}$

e) $x = 0 \rightarrow y = 2$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $[-2,\ \infty)$

g)



h) *Increasing:* $(2,\ \infty)$ $\qquad$ *Decreasing*: $(-\infty,\ 2)$

Exercise

For the function $f(x) = -2x^2 + 16x - 26$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = -\frac{16}{-4}$ $\qquad x = -\frac{b}{2a}$

$= 4$

$f(4) = -32 + 64 - 26$

$= 6$

Vertex point: $(4,\ 6)$

b) Axis of *symmetry*: $x = 4$

c) *Maximum* point @ $(4,\ 6)$

d) $-2x^2 + 16x - 26 = 0$

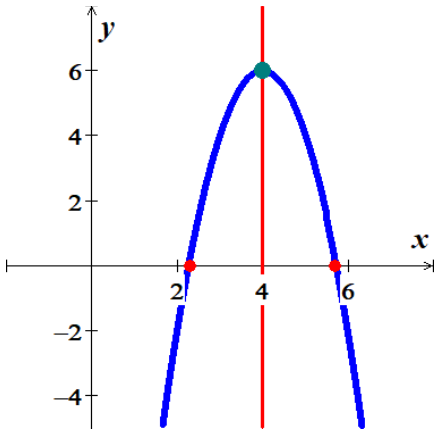
$x = \frac{-16 \pm \sqrt{128}}{-4}$

$x = 4 \pm 2\sqrt{2}$

e) $x = 0 \rightarrow y = -26$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $(-\infty,\ 6]$

g)



h) *Increasing:* $(-\infty,\ 4)$ $\qquad$ *Decreasing*: $(4,\ \infty)$

Exercise

For the function $f(x) = x^2 + 4x + 1$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = -\frac{4}{2}$ $\qquad x = -\frac{b}{2a}$

$= -2$

$f(-2) = 4 - 8 + 1$

$= -3$

Vertex point: $(-2,\ -3)$

b) Axis of *symmetry*: $x = -2$

c) *Minimum* point @ $(-2,\ -3)$

d) $x^2 + 4x + 1 = 0$

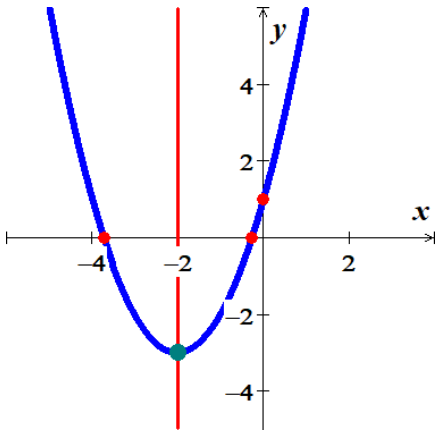
$x = \frac{-4 \pm \sqrt{12}}{2}$

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

e) $x = 0 \rightarrow y = 1$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $[-3,\ \infty)$

g)



h) *Increasing:* $(-2,\ \infty)$ $\qquad$ *Decreasing*: $(-\infty,\ -2)$

Exercise

For the function $f(x) = x^2 - 8x + 5$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = -\frac{-8}{2}$ $\qquad x = -\frac{b}{2a}$

$= 4$

$f(4) = 16 - 32 + 5$

$= -11$

Vertex point: $(4,\ -11)$

b) Axis of *symmetry*: $x = 4$

c) *Minimum* point @ $(4,\ -11)$

d) $x^2 - 8x + 5 = 0$

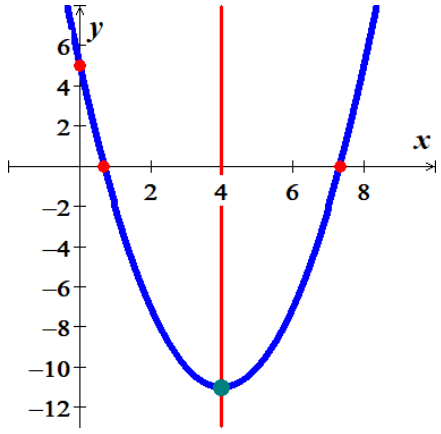
$x = \frac{8 \pm \sqrt{44}}{2}$

$x = 4 \pm \sqrt{11}$

e) $x = 0 \rightarrow y = 5$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $[-11,\ \infty)$

g)



h) *Increasing:* $(4,\ \infty)$ $\qquad$ *Decreasing*: $(-\infty,\ 4)$

Exercise

For the function $f(x) = x^2 + 6x - 1$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = -\frac{6}{2}$ $\qquad x = -\frac{b}{2a}$

$= -3$

$f(-3) = 9 - 18 - 1$

$= -10$

Vertex point: $(-3,\ -10)$

b) Axis of *symmetry*: $x = -3$

c) *Minimum* point @ $(-3,\ -10)$

d) $x^2 + 6x - 1 = 0$

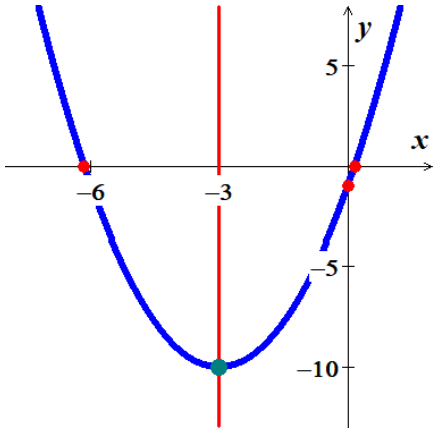
$x = \frac{-6 \pm \sqrt{40}}{2}$

$x = -3 \pm \sqrt{10}$

e) $x = 0 \rightarrow y = -1$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $[-10,\ \infty)$

g)



h) *Increasing:* $(-3,\ \infty)$ $\qquad$ *Decreasing*: $(-\infty,\ -3)$

Exercise

For the function $f(x) = x^2 + 6x + 3$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = -\frac{6}{2}$ $\qquad x = -\frac{b}{2a}$

$= -3$

$f(-3) = 9 - 18 + 3$

$= -6$

Vertex point: $(-3,\ -6)$

b) Axis of *symmetry*: $x = -3$

c) *Minimum* point @ $(-3,\ -6)$

d) $x^2 + 6x + 3 = 0$

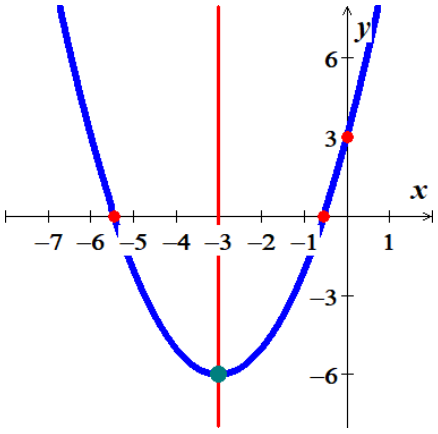
$x = \frac{-6 \pm \sqrt{24}}{2}$

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

e) $x = 0 \rightarrow y = 3$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $[-6,\ \infty)$

g)



h) *Increasing:* $(-3,\ \infty)$ $\qquad$ *Decreasing*: $(-\infty,\ -3)$

Exercise

For the function $f(x) = x^2 - 10x + 3$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = -\frac{-10}{2}$ $\qquad x = -\frac{b}{2a}$

$= 5$

$f(5) = 25 - 50 + 3$

$= -22$

Vertex point: $(5,\ -22)$

b) Axis of *symmetry*: $x = 5$

c) *Minimum* point @ $(5,\ -22)$

d) $x^2 - 10x + 3 = 0$

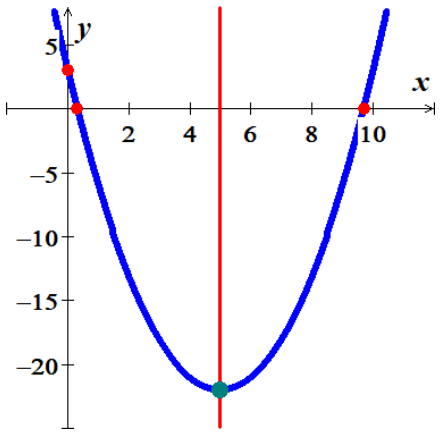
$x = \frac{10 \pm \sqrt{88}}{2}$

$x = 5 \pm \sqrt{22}$

e) $x = 0 \rightarrow y = 3$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $[-22,\ \infty)$

g)



h) *Increasing:* $(5,\ \infty)$ $\qquad$ *Decreasing*: $(-\infty,\ 5)$

Exercise

For the function $f(x) = x^2 - 3x + 4$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = \frac{3}{2}$ $\qquad x = -\frac{b}{2a}$

$$f\left(\frac{3}{2}\right) = \frac{9}{4} - \frac{9}{2} + 4$$

$$= \frac{7}{4}$$

Vertex point: $\left(\frac{3}{2},\ \frac{7}{4}\right)$

b) Axis of *symmetry*: $x = \frac{3}{2}$

c) *Minimum* point @ $\left(\frac{3}{2},\ \frac{7}{4}\right)$

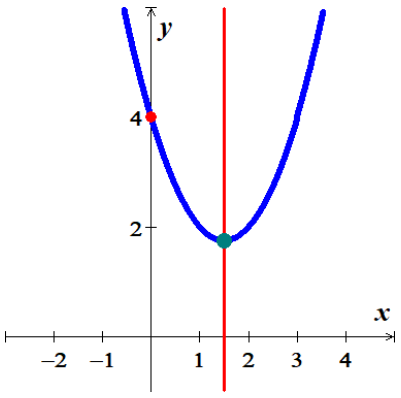
d) $x^2 - 3x + 4 = 0$

$$x = \frac{3 \pm \sqrt{-7}}{2} \quad \mathbb{C}$$

e) $x = 0 \rightarrow y = 4$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $\left[\frac{7}{4},\ \infty\right)$

g)



h) *Increasing:* $\left(\frac{3}{2},\ \infty\right)$ $\qquad$ *Decreasing:* $\left(-\infty,\ \frac{3}{2}\right)$

Exercise

For the function $f(x) = x^2 - 3x - 4$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = \frac{3}{2}$ $\qquad x = -\frac{b}{2a}$

$$f\left(\frac{3}{2}\right) = \frac{9}{4} - \frac{9}{2} - 4$$

$$= -\frac{25}{4}$$

Vertex point: $\left(\frac{3}{2},\ -\frac{25}{4}\right)$

b) Axis of *symmetry*: $x = \frac{3}{2}$

c) *Minimum* point @ $\left(\frac{3}{2},\ -\frac{25}{4}\right)$

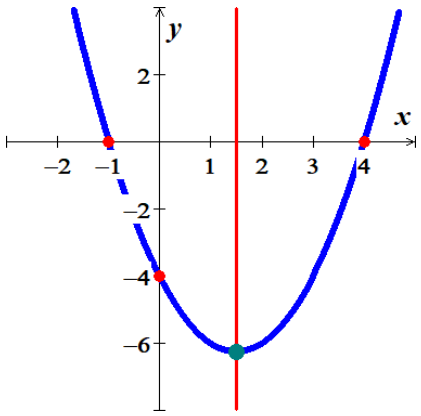
d) $x^2 - 3x - 4 = 0$

$x = -1,\ 4$

e) $x = 0 \rightarrow y = -4$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $\left[-\frac{25}{4},\ \infty\right)$

g)



h) *Increasing:* $\left(\frac{3}{2},\ \infty\right)$ $\qquad$ *Decreasing*: $\left(-\infty,\ \frac{3}{2}\right)$

Exercise

For the function $f(x) = x^2 - 4x - 5$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

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

$f(2) = 4 - 8 - 5$

$= -9$

Vertex point: $(2,\ -9)$

b) Axis of *symmetry*: $x = 2$

c) *Minimum* point @ $(2,\ -9)$

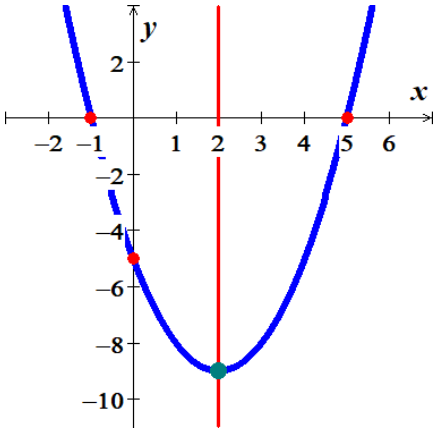
d) $x^2 - 4x - 5 = 0$

$x = -1,\ 5$

e) $x = 0 \rightarrow y = -5$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $[-9,\ \infty)$

g)



h) *Increasing:* $(2,\ \infty)$ $\qquad$ *Decreasing*: $(-\infty,\ 2)$

Exercise

For the function $f(x) = 2x^2 - 3x + 1$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $\underline{x = \frac{3}{4}}$ $\qquad x = -\frac{b}{2a}$

$$f\left(\frac{3}{4}\right) = \frac{9}{8} - \frac{9}{4} + 1$$

$$= \underline{-\frac{1}{8}}$$

Vertex point: $\underline{\left(\frac{3}{4},\ -\frac{1}{8}\right)}$

b) Axis of *symmetry*: $\underline{x = \frac{3}{4}}$

c) *Minimum* point @ $\underline{\left(\frac{3}{4},\ -\frac{1}{8}\right)}$

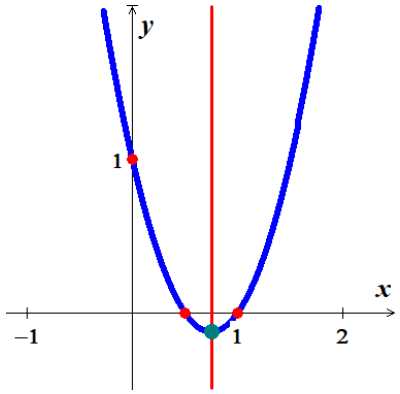
d) $2x^2 - 3x + 1 = 0$

$\underline{x = 1,\ \frac{1}{2}}$

e) $x = 0 \rightarrow \underline{y = 1}$

f) *Domain*: $\underline{\mathbb{R}}$ $\qquad$ *Range*: $\underline{\left[-\frac{1}{8},\ \infty\right)}$

g)



h) *Increasing:* $\underline{\left(\frac{3}{4},\ \infty\right)}$ $\qquad$ *Decreasing*: $\underline{\left(-\infty,\ \frac{3}{4}\right)}$

Exercise

For the function $f(x) = -x^2 - 3x + 4$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = -\frac{3}{2}$ $\qquad x = -\frac{b}{2a}$

$$f\left(-\frac{3}{2}\right) = -\frac{9}{4} + \frac{9}{2} + 4$$

$$= \frac{7}{2}$$

Vertex point: $\left(-\frac{3}{2},\ \frac{7}{2}\right)$

b) Axis of *symmetry*: $x = -\frac{3}{2}$

c) *Maximum* point @ $\left(-\frac{3}{2},\ \frac{7}{2}\right)$

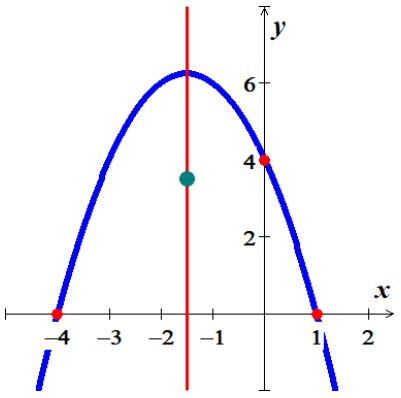
d) $-x^2 - 3x + 4 = 0$

$x = 1,\ -4$

e) $x = 0 \rightarrow y = 4$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $\left(-\infty,\ \frac{7}{2}\right]$

g)



h) *Increasing:* $\left(-\infty,\ -\frac{3}{2}\right)$ $\qquad$ *Decreasing*: $\left(-\frac{3}{2},\ \infty\right)$

Exercise

For the function $f(x) = -2x^2 + 3x - 1$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = \frac{3}{4}$ $\qquad x = -\frac{b}{2a}$

$f\left(\frac{3}{4}\right) = -\frac{9}{8} + \frac{9}{4} - 1$

$= \frac{1}{8}$

Vertex point: $\left(\frac{3}{4},\ \frac{1}{8}\right)$

b) Axis of *symmetry*: $x = \frac{3}{4}$

c) *Maximum* point @ $\left(\frac{3}{4},\ \frac{1}{8}\right)$

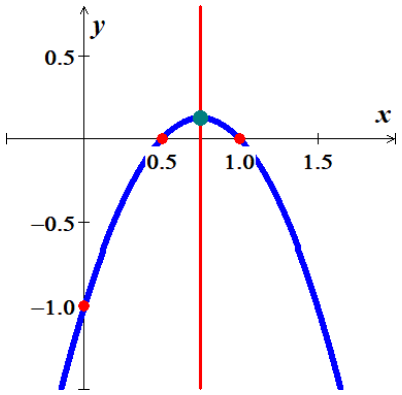
d) $-2x^2 + 3x - 1 = 0$

$x = 1,\ \frac{1}{2}$

e) $x = 0 \rightarrow y = -1$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $\left(-\infty,\ \frac{1}{8}\right]$

g)



h) *Increasing:* $\left(-\infty,\ \frac{3}{4}\right)$ $\qquad$ *Decreasing*: $\left(\frac{3}{4},\ \infty\right)$

Exercise

For the function $f(x) = -2x^2 - 3x - 1$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

a) $x = -\frac{3}{4}$ $\qquad x = -\frac{b}{2a}$

$$f\left(-\frac{3}{4}\right) = -\frac{9}{8} + \frac{9}{4} - 1$$

$$= \frac{1}{8}$$

Vertex point: $\left(-\frac{3}{4},\ \frac{1}{8}\right)$

b) Axis of *symmetry*: $x = -\frac{3}{4}$

c) *Maximum* point @ $\left(-\frac{3}{4},\ \frac{1}{8}\right)$

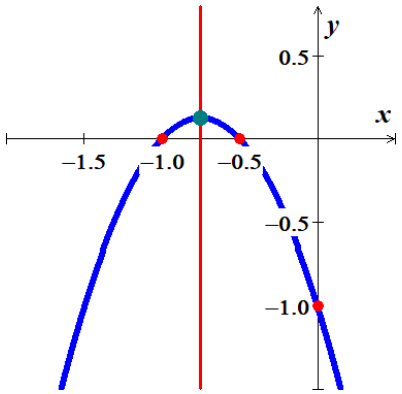
d) $-2x^2 - 3x - 1 = 0$

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

e) $x = 0 \rightarrow y = -1$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $\left(-\infty,\ \frac{1}{8}\right]$

g)



h) *Increasing:* $\left(-\infty,\ -\frac{3}{4}\right)$ $\qquad$ *Decreasing*: $\left(-\frac{3}{4},\ \infty\right)$

Exercise

For the function $f(x) = -x^2 - 4x + 5$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

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

$f(-2) = -4 + 8 + 5$

$= 9$

Vertex point: $(-2,\ 9)$

b) Axis of *symmetry*: $x = -2$

c) *Maximum* point @ $(-2,\ 9)$

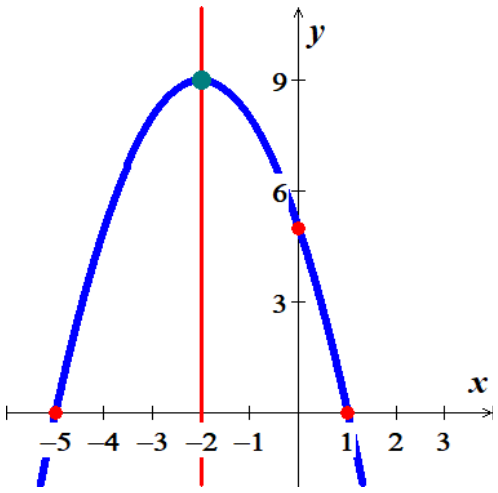
d) $-x^2 - 4x + 5 = 0$

$x = 1,\ -5$

e) $x = 0 \rightarrow y = 5$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $(-\infty,\ 9]$

g)



h) *Increasing:* $(-\infty,\ -2)$ $\qquad$ *Decreasing*: $(-2,\ \infty)$

Exercise

For the function $f(x) = -x^2 + 4x + 2$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

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

$f(2) = -4 + 8 + 2$

$= 6$

Vertex point: $(2,\ 6)$

b) Axis of *symmetry*: $x = 2$

c) *Maximum* point @ $(2,\ 6)$

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

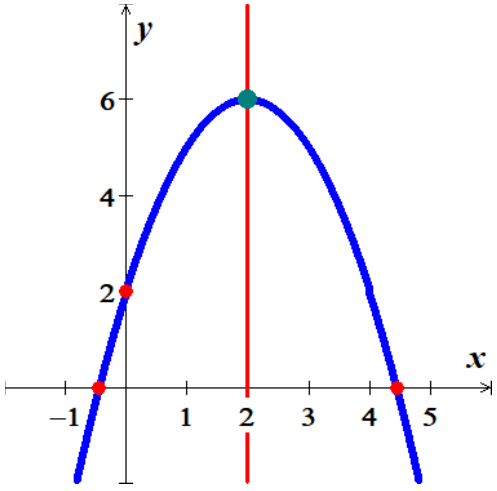
$x = \frac{-4 \pm \sqrt{16 + 8}}{-2}$

$x = 2 \pm \sqrt{6}$

e) $x = 0 \rightarrow y = 2$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $(-\infty,\ 6]$

g)



h) *Increasing:* $(-\infty,\ 2)$ $\qquad$ *Decreasing*: $(2,\ \infty)$

Exercise

For the function $f(x) = -3x^2 + 3x + 7$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

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

$f\left(\frac{1}{2}\right) = -\frac{3}{4} + \frac{3}{2} + 7 \quad = \frac{31}{4}$

Vertex point: $\left(\frac{1}{2},\ \frac{31}{4}\right)$

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

c) *Maximum* point @ $\left(\frac{1}{2},\ \frac{31}{4}\right)$

d) $-3x^2 + 3x + 7 = 0$

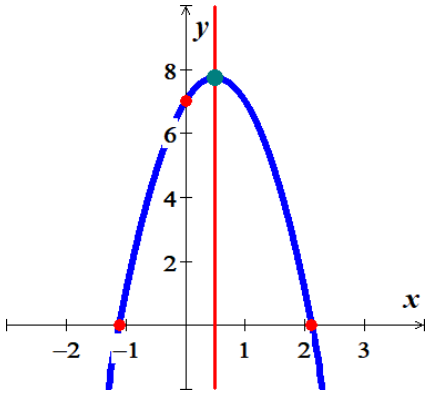
$x = \frac{-3 \pm \sqrt{93}}{-6}$

$x = \frac{3 \pm \sqrt{93}}{6}$

e) $x = 0 \rightarrow y = 7$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $\left(-\infty,\ \frac{31}{4}\right]$

g)



h) *Increasing:* $\left(-\infty,\ \frac{1}{2}\right)$ $\qquad$ *Decreasing*: $\left(\frac{1}{2},\ \infty\right)$

Exercise

For the function $f(x) = -x^2 + 2x - 2$

a) Find the vertex point
b) Find the line of symmetry
c) State whether there is a *maximum* or *minimum* value *and* find that value
d) Find the zeros of $f(x)$
e) Find the *y*-intercept
f) Find the *range* and the *domain* of the function.
g) Graph the function
h) On what intervals is the function *increasing*? *decreasing*?

Solution

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

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

$= -1$

Vertex point: $(1, -1)$

b) Axis of *symmetry*: $x = 1$

c) *Maximum* point @ $(1, -1)$

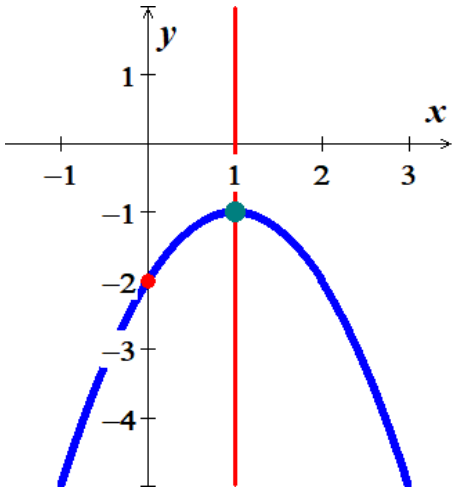
d) $-x^2 + 2x - 2 = 0$

$x = \frac{-2 \pm \sqrt{-4}}{-2}$ $\mathbb{C}$

e) $x = 0 \rightarrow y = -2$

f) *Domain*: $\mathbb{R}$ $\qquad$ *Range*: $(-\infty, -1]$

g)



h) *Increasing:* $(-\infty, 1)$ $\qquad$ *Decreasing*: $(1, \infty)$