

Lesson One
Quadratic Functions – Translations

1. Which of the following relations below are quadratic functions:

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

b) $y = x^3 + 2x - 1$

c) $y = \frac{1}{x+1}$

d) $y = \frac{1}{x^2}$

e) $y = \sqrt{x} + 2$

f) $y = \frac{1}{4}x^2$

2. Sketch the graph for each of the following parabola without a calculator (label vertex and the coordinates of two other points) and then state:

- a) equation of axis of symmetry
- b) direction of opening
- c) the maximum or minimum value
- d) exact values of the x -intercept(s) (if any) and the y -intercept
- e) the domain and range

i) $y = x^2 - 4$

ii) $y = x^2 + 2$

iii) $y = (x-2)^2 + 1$

iv) $y = (x+1)^2 - 2$

v) $y = (x+3)^2$

vi) $y = -(x-1)^2$

vii) $y = -(x+3)^2 + 1$

viii) $y = -(x-1)^2 - 3$

3. Write the new equation of the parabola $y = x^2$ after the following:

- a) a horizontal translation 4 units to the left and a vertical translation 2 units down.
- b) a horizontal translation 2 units right and a vertical translation 3 units up.
- c) the parabola opens downwards and translated 3 units up.
- d) the parabola opens downwards and is translated 4 units right.

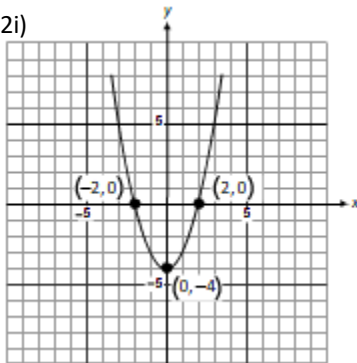
4. If the point $(3, 9)$ is on the parabola $y = x^2$, what would the coordinates of this point become:

- a) if the parabola was shifted up three units and left 2 units?
- b) if the parabola was shifted down 1 unit and right 5 units?

ANSWERS

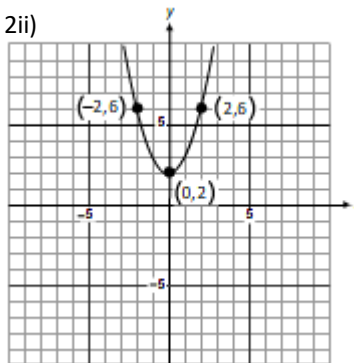
1) a and f are quadratics

2i)



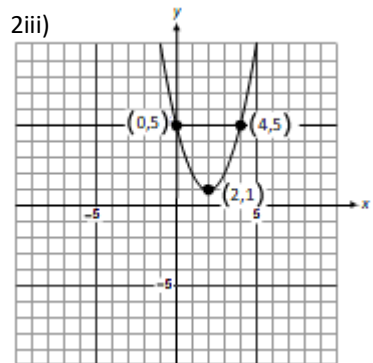
- 2ia) $x = 0$
- 2ib) up
- 2ic) min of -4 when $x = 0$
- 2id) $(2, 0)$ $(-2, 0)$ $(0, -4)$
- 2ie) Domain: $x \in R$ Range: $y \geq -4$

2ii)



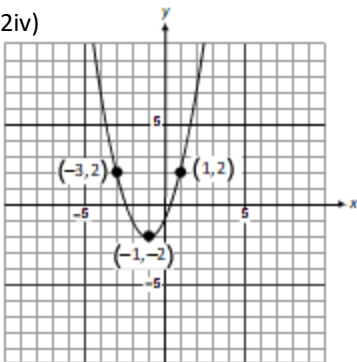
- 2iia) $x = 0$
- 2iib) up
- 2iic) min of 2 when $x = 0$
- 2iid) none $(0, 2)$
- 2iie) Domain: $x \in R$ Range: $y \geq 2$

2iii)



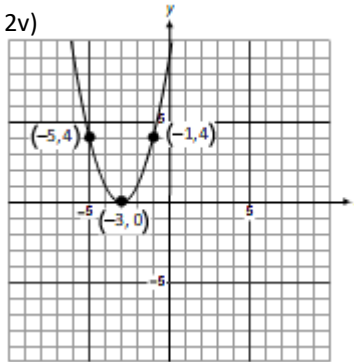
- 2iiia) $x = 2$
- 2iiib) up
- 2iiic) min of 1 when $x = 2$
- 2iiid) none $(0, 5)$
- 2iiie) Domain: $x \in R$ Range: $y \geq 1$

2iv)



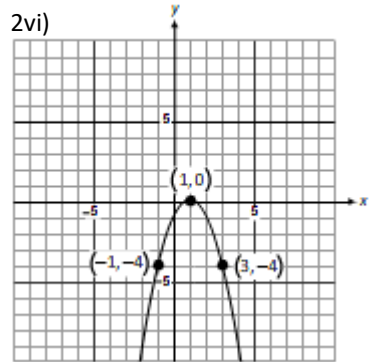
- 2iva) $x = -1$
- 2ivb) up
- 2ivc) min of -2 when $x = -1$
- 2ivd) $(-1 + \sqrt{2}, 0)$ $(-1 - \sqrt{2}, 0)$ $(0, -1)$
- 2ive) Domain: $x \in R$ Range: $y \geq -2$

2v)



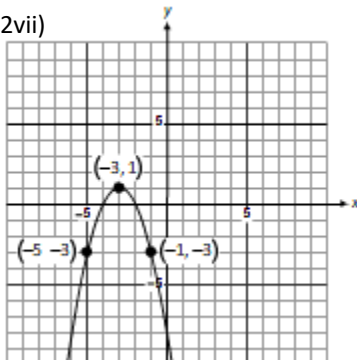
- 2va) $x = -3$
- 2vb) up
- 2vc) min of 0 when x is -3
- 2vd) $(-3, 0)$ $(0, 9)$
- 2ve) Domain: $x \in R$ Range: $y \geq 0$

2vi)



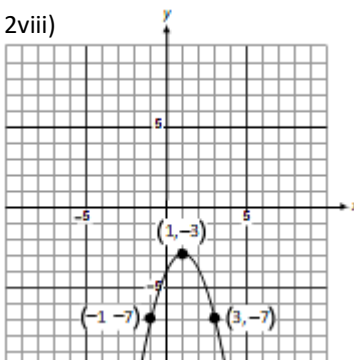
- 2via) $x = 1$
- 2vib) down
- 2vic) max of 0 when x is 1
- 2vid) $(1, 0)$ $(0, -1)$
- 2vie) Domain: $x \in R$ Range: $y \leq 0$

2vii)



- 2viiia) $x = -3$
- 2viiib) down
- 2viiic) max of 1 when x is -3
- 2viiid) $(-2, 0)$ $(-4, 0)$ $(0, -8)$
- 2viiie) Domain: $x \in R$ Range: $y \leq 1$

2viii)



- 2viiiia) $x = 1$
- 2viiiib) down
- 2viiiic) max of -3 when x is 1
- 2viiiid) none $(0, -4)$
- 2viiiie) Domain: $x \in R$ Range: $y \leq -3$

3a) $y = (x+4)^2 - 2$

3b) $y = (x-2)^2 + 3$

3c) $y = -x^2 + 3$

3d) $y = -(x-4)^2$

4a) $(1, 12)$

4b) $(8, 8)$