BLM Answers

BLM 4-1 Prerequisite Skills

1. a) 11.1 **b)** –2.7 **c)** –9.0 **d)** –20.2
2. a) 1.7 **b)** –10.7 **c)** –6.5 **d)** 25.1
3. a) 9.5 **b)** –20.7 **c)** –96 **d)** 31.85
4. a) $-3x$ **b)** $-6x^2 + 6x + 5$
c) $10x^2 - 2x + 6$ **d)** $-12x^2 + 10x - 6$
5. a) 5 **b)** 0 **c)** 12 **d)** –2
6. a) –20 **b)** –26 **c)** 10 **d)** 80
7. a) 12 **b)** –13 **c)** –63 **d)** –3

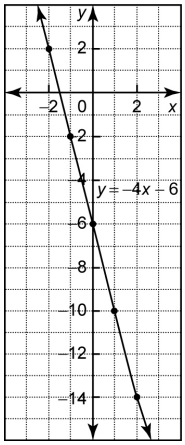
8. a)

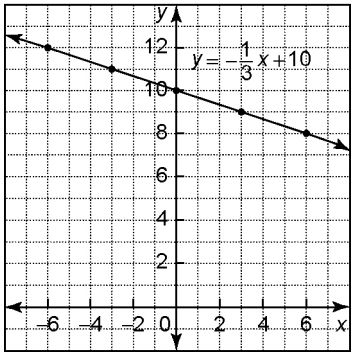
x	$y = -4x - 6$
–2	**2**
–1	**–2**
0	**–6**
1	**–10**
2	**–14**

b)

x	$y = -\frac{1}{3}x + 10$
–6	**12**
–3	**11**
0	**10**
3	**9**
6	**8**

9. a)





b) $m = -4$, $b = -6$; $m = -\frac{1}{3}$, $b = 10$

10. a)

x	y	First Differences
0	3	
		4
2	7	
		4
4	11	
		4
6	15	
		4
8	19	

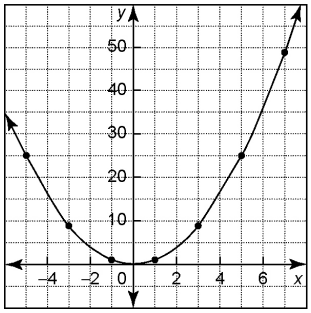
x	y	First Differences
0	0	
		1
1	1	
		7
2	8	
		19
3	27	
		37
4	64	

11. a) $m = -2$, $b = 3$ **b)** $m = \frac{1}{2}$, $b = -1$
c) $m = 3$, $b = 0$ **d)** $m = -\frac{1}{4}$, $b = 5$

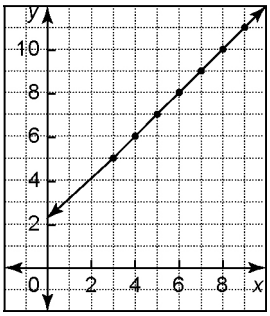
12. a) down 3 units, left 5 units
b) up 3 units, left 4 units
c) right 6 units
d) reflection in the y-axis

BLM 4-3 Section 4.1 Modelling With Quadratic Relations

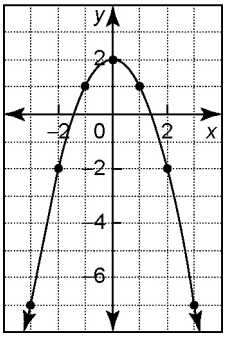
1. a) quadratic



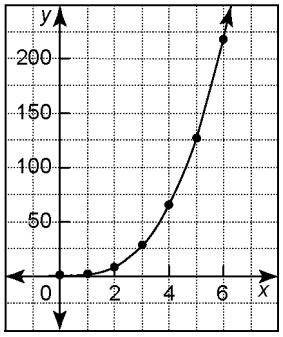
b) linear



c) quadratic



d) neither



2. a) second differences are 8; quadratic.
b) first differences are 1; linear.
c) second differences are 2; quadratic.
d) first and second differences are different; neither linear nor quadratic.

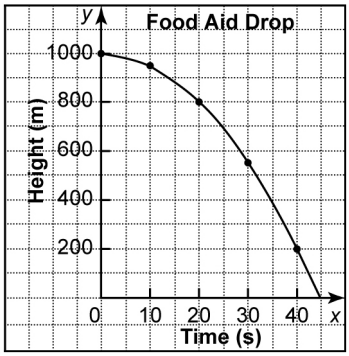
3. quadratic: **b), d), f)**; all have a x^2 term.

4. a) maximum; (10, 500) **b)** minimum; (6, 110)
c) minimum; (11, 330)

5. a)

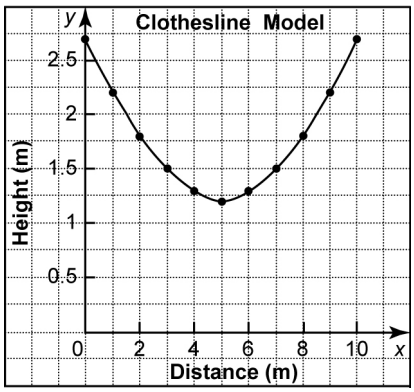
Time (s)	Height (m)
0	**1000**
10	**950**
20	**800**
30	**550**
40	**200**

b)



c) Yes. The relation has a t^2 term.

6. a)

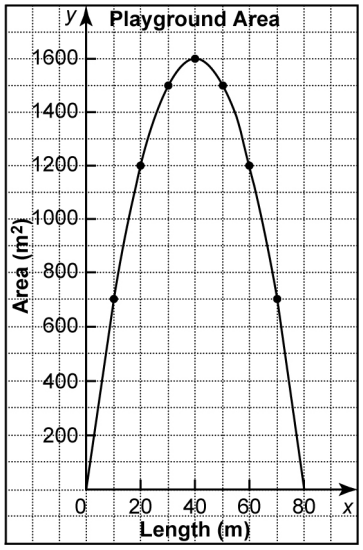


b) Yes, because the graph is a parabola.

7. a), b)

Length (m)	Width (m)	Perimeter (m)	Area (m^2)
70	10	160	**700**
60	20	**160**	**1200**
50	30	**160**	**1500**
40	40	**160**	**1600**
30	50	**160**	**1500**
20	60	**160**	**1200**
10	70	**160**	**700**

c)

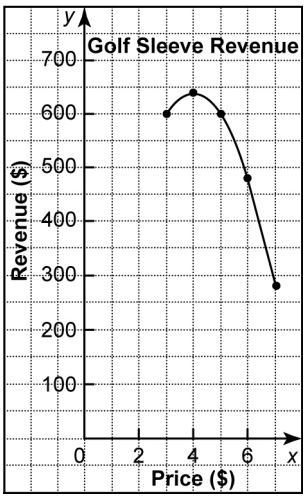


d) $l = 40$ m, $w = 40$ m

8. a)

Price ($)	Number Sold	Revenue ($)
3	200	600
4	**160**	**640**
5	**120**	**600**
6	**80**	**480**
7	**40**	**280**

b)



c) \$4 per sleeve **d)** \$640

BLM 4-5 Section 4.2 The Quadratic Relation $y = ax^2 + k$

1. a) $-1 < a < 0$ **b)** $a > 1$ **c)** $0 < a < 1$ **d)** $a < -1$

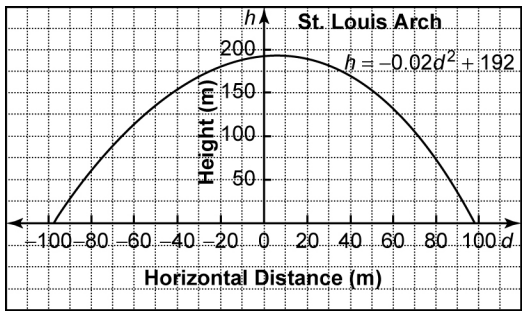
2. a) opens downward, vertically compressed, vertex at (0, 2)
b) opens upward, vertically stretched, vertex at (0, 0)
c) opens downward, vertically compressed, vertex at (0, –6)
d) opens upward, vertex at (0, 4)
e) opens downward, vertically stretched, vertex at (0, –5)
f) opens upward, vertically compressed, vertex at (0, 2)
g) opens upward, vertically stretched, vertex at (0, 4)
h) opens downward, vertically compressed, vertex at (0, –3)

3. a) $y = 3x^2$ **b)** $y = 0.5x^2 + 1$ **c)** $y = -2x^2 - 4$

4. a) positive **b)** negative **c)** negative **d)** positive

5. a) i), **ii)** second relation
b) i) second relation **ii)** first relation
c) i), **ii)** first relation
d) i), **ii)** second relation **e) i), ii)** second relation
f) i) first relation **ii)** second relation

6. a)



b) 192 m **c) i)** 184 m **ii)** 120 m **iii)** 64 m

7. a) C **b)** B **c)** A

8. a) $y = 4x^2$ **b)** $y = 0.3x^2$ **c)** $y = 3x^2 + 4$ **d)** $y = -x^2 - 3$

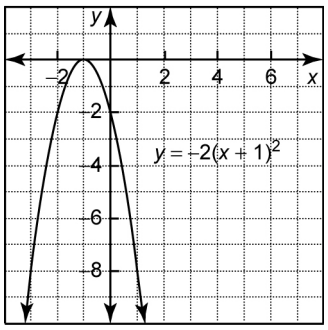
BLM 4-6 Section 4.3 The Quadratic Relation $y = a(x - h)^2$

1. a) $h = 6$, vertex is (6, 0) **b)** $h = -5$, vertex is (–, 0)
c) $h = -4$; vertex is (–4, 0) **d)** $h = 3$; vertex is (3, 0)

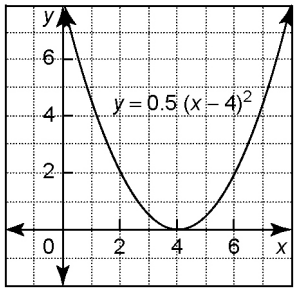
2. a) $a = 1$, $h = -3$ **b)** $a = 1$, $h = 1$ **c)** $a = -1$, $h = -2$
d) $a = 0.5$, $h = 4$ **e)** $a = -2$, $h = -1$ **f)** $a = 0.4$, $h = 6$
g) $a = -1.5$, $h = -5$ **h)** $a = -3$, $h = 2$

3. a) translated 1 unit right, vertically stretched by a factor of 2; $a = 2$, $h = 1$
b) translated 3 units left, reflected in the x-axis; $a = -1$, $h = -3$
c) translated 5 units left, vertically compressed by a factor of $\frac{1}{2}$; $a = 0.5$, $h = -5$
d) translated 4 units right, vertically stretched by a factor of 3, and reflected in the x-axis; $a = -3$, $h = 4$

4. a) $y = -2(x + 1)^2$



b) $y = 0.5(x - 4)^2$

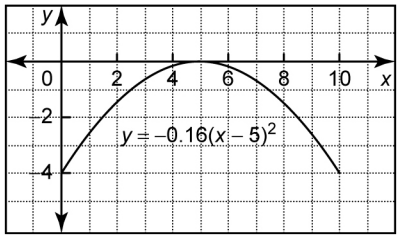


5. a) $y = 2(x - 3)^2$; its vertex is at (3, 0), the vertex of the first parabola is at (–2. 0).
b) $y = 8(x - 5)^2$; its vertex is at (5, 0), the vertex of the second parabola is at (–2, 0).

6. a) B **b)** C **c)** A

7. a) $y = -(x - 4)^2$ **b)** $y = 0.6(x + 2)^2$
c) $y = -2(x - 6)^2$ **d)** $y = (x + 10)^2$

8. a)



b) 4 m **c)** 2600 arches

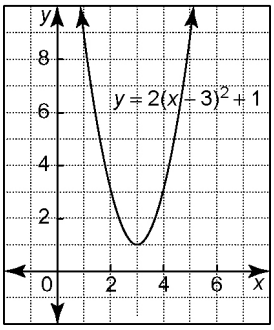
BLM 4-7 Section 4.4 The Quadratic Relation $y = a(x - h)^2 + k$

1. a) i) (–1, 2) **ii)** positive **b) i)** (3, 4) **ii)** positive
c) i) (1, –4) **ii)** negative **d) i)** (6, –3) **ii)** negative

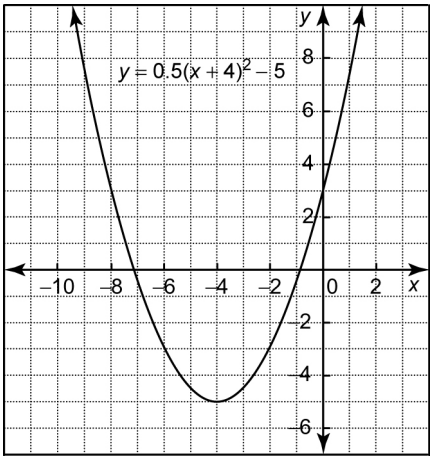
2. a) (2, 1), $y = -2(x - 2)^2 + 1$
b) (3, –1), $y = 2(x + 3)^2 - 1$
c) (4, 2), $y = -0.5(x - 4)^2 + 2$
d) (–4, 3), $y = 3(x + 4)^2 + 3$

3. a) (2, 4), opens upward, vertically stretched
b) (–1, 3), opens downward, vertically compressed
c) (3, 1), opens downward, vertically stretched
d) (–5, 2), opens upward, vertically stretched
e) (3, –2), opens downward, vertically compressed
f) (0, 1), opens upward, vertically stretched

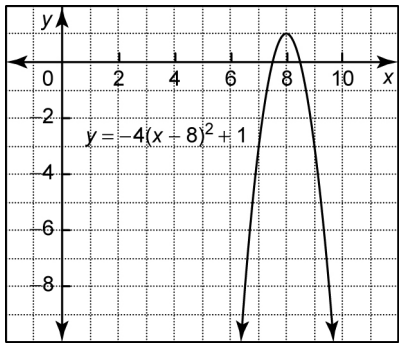
4. a)



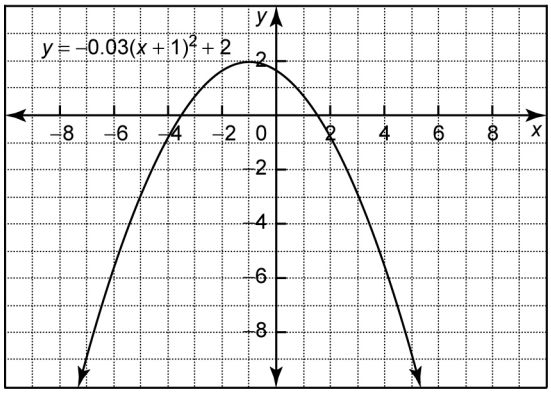
b)



c)

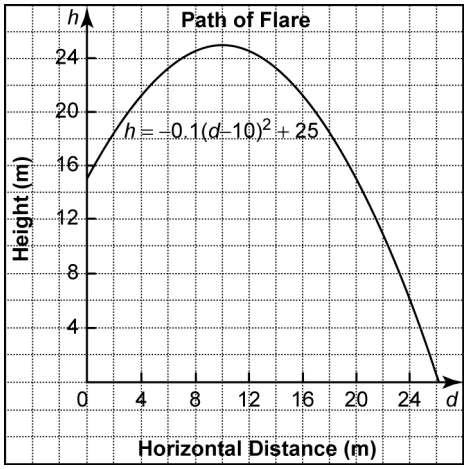


d)



5. A

6. a) (10, 25) The maximum height of 25 m is reached when the flare has travelled 10 m horizontally.
b) 15 m
c)



7. a) (4, 33) **b)** 33 m **c)** 25 m
d) The maximum height of 33 m is reached when the ball has covered a horizontal distance of 4 m.

8. a) $y = 2x^2$ **b)** $y = 3(x - 5)^2 + 4$ **c)** $y = -0.5(x + 4)^2 - 3$

9. a) (21, 60 840)
b) When the price is increased 21 times, the maximum revenue of $60 840 from room rentals will be reached.
c) $156

BLM 4-9 Section 4.5 Interpret Graphs of Quadratic Relations

1. a) 6 **b)** 7 **c)** –9 **d)** –60

2. a) i) 3, –3 **ii)** –9 **iii)** minimum **iv)** (0, –9)
b) i) 2, 4 **ii)** 16 **iii)** minimum **iv)** (3, –2)
c) i) –1, 5 **ii)** 5 **iii)** maximum **iv)** (2, 9)
d) i) none **ii)** –5 **iii)** maximum **iv)** (–2, –1)

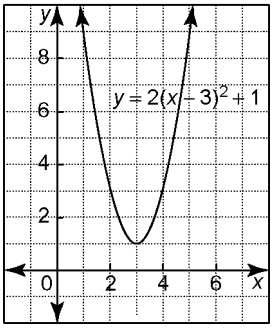
3. a) B **b)** A **c)** C

4. a) C **b)** B **c)** A

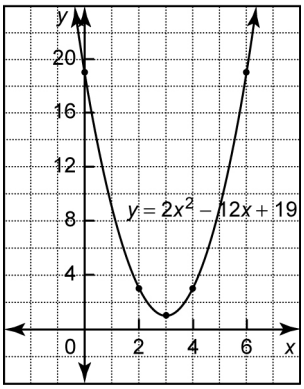
5. a) (4, 96) **b)** 4 s **c)** 96 m **d)** 12 m

6. a) 60 m **b)** 5 s **c)** 40 m **d)** 40 m
e) They are the same: both 20 m less than the maximum height.
f) 60 m

7. a)



b)



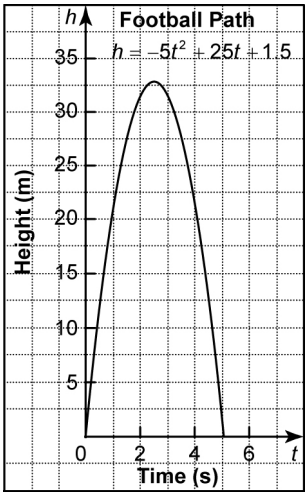
c) The graphs are the same. The equations are in different forms but represent the same relation.

BLM 4-11 Chapter 4 Review

1. quadratic: **a), d)**; both have an x^2 term.

2. a)

t	*h*
0	1.5
1	21.5
2	31.5
3	31.5
4	21.5
5	1.5



b) 5.7 s

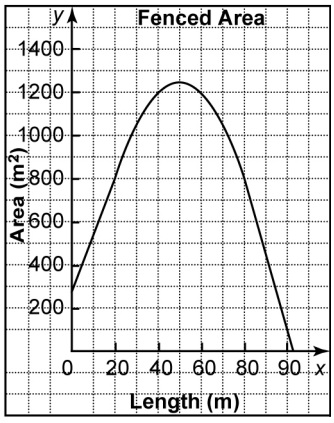
c) (2.5, 32.75); The ball reached its maximum height of 32.75 m after 2.5 s.

d) The ball was thrown from a height of 1.5 m.

3. a), b)

Length (m)	Width (m)	Perimeter (m)	Area (m^2)
80	10	100	**800**
70	15	**100**	**1050**
60	20	**100**	**1200**
50	25	**100**	**1250**
40	30	**100**	**1200**
30	35	**100**	**1050**
20	40	**100**	**800**

c)



d) length 50 m, width 25 m

4. a) reflected in the x-axis, vertically compressed by a factor of 0.5
b) translated down 2 units
c) vertically stretched by a factor of 2. translated up 7 units
d) reflected in the x-axis, vertically stretched by a factor of 3, translated down 5 units

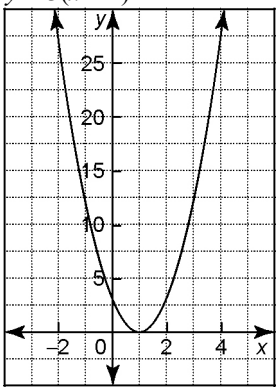
5. a) negative **b)** positive **c)** positive **d)** negative

6. a) $y = -2x^2$ **b)** $y = 0.5x^2$
c) $y = 2x^2 - 3$ **d)** $y = -x^2 + 11$

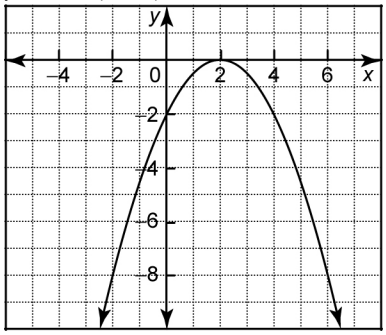
7. Answers may vary. Sample answer: The expression is expressed as $x - h$ so that h is the x-coordinate of the vertex.

8. a) A **b)** B **c)** C

9. a) $y = 3(x - 1)^2$

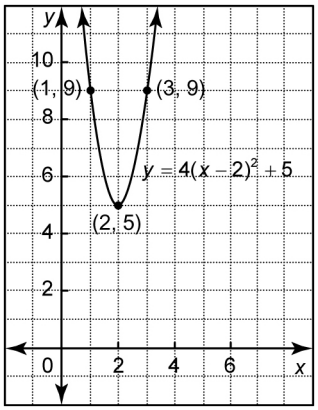


b) $y = -0.5(x - 2)^2$

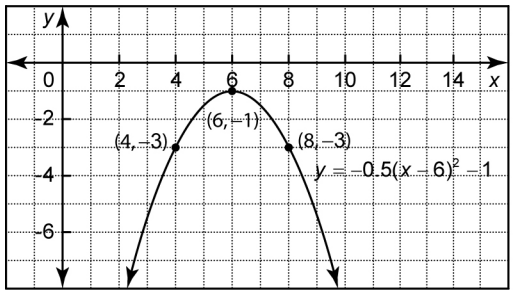


10. a) (–3, –1), positive
b) (1, 2), positive
c) (–3, 3), negative
d) (1, –5), negative

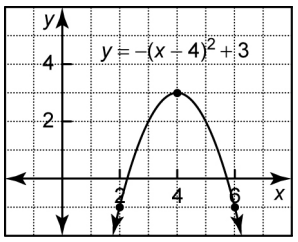
11. a)



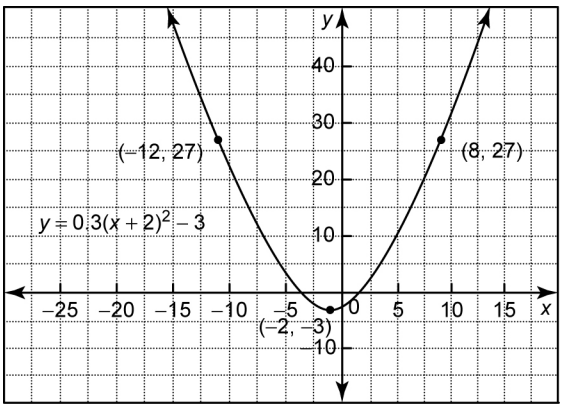
b)



c)



d)

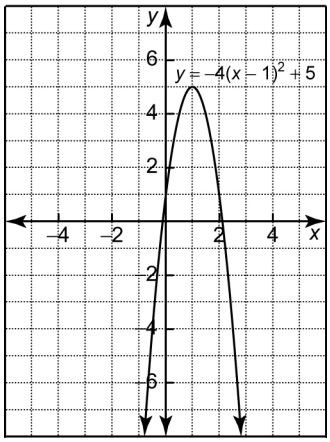


12. a) (9, 57) **b)** 57 m **c)** 54 m
d) The maximum height of 57 m is reached 9 m from where the ball was hit.

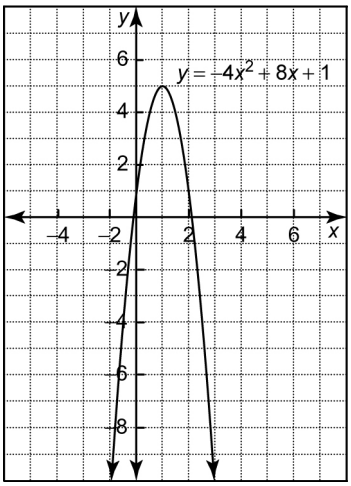
13. a) –9 **b)** 34 **c)** –14 **d)** –47

14. a) (26, 5) **b)** 26 s **c)** 5 m **d)** 1.62 m

15. a)



b)



c) The graphs are the same. The equations are in different forms but represent the same relation.

BLM 4-12 Chapter 4 Practice Test

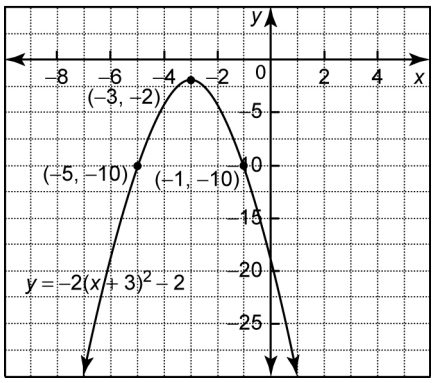
1. a) F **b)** T **c)** F **d)** T **e)** F **f)** F

2. Yes. If each first difference differs by –3 from the one before it, then the second differences would all be –3. A constant second difference means the relation is quadratic.

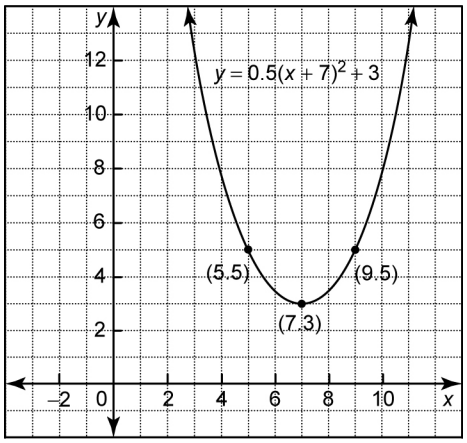
3. a) vertical stretch by a factor of 2, a translation 3 units right
b) translation 4 units left and 1 unit down
c) vertical compression by a factor of 0.5, a reflection in the *x*-axis, a translation 3 units up
d) vertical compression by a factor of 0.3, a translation 2 units right and 1 unit down

4. a) $a = 1$, $h = 2$, $k = 2$; vertex at (2, 2)
b) $a = –0.5$, $h = –3$, $k = –1$; vertex at (–3, –1)
c) $a = –1$, $h = –1$, $k = 1$; vertex at (–1, 1)
d) $a = –2$, $h = –4$, $k = 3$; vertex at (–4, 3)

5. a) i) (–3, –2) **ii)** –1, –5 **iii)** (–1, –10), (–5, –10)
iv)

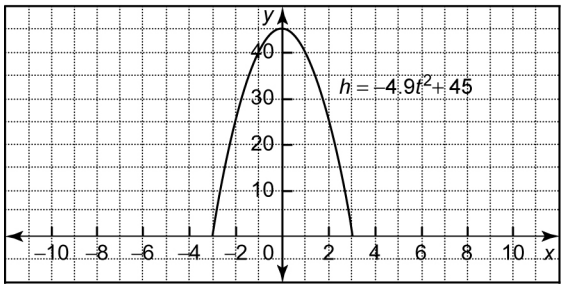


b) i) (7, 3) **ii)** 5, 9 **iii)** (5, 5), (9, 5)
iv)



6. a) (5, –8) **b)** (3, 0), (7, 0)
c) $a = 2$ **d)** $y = 2(x – 5)^2 – 8$

7. a)



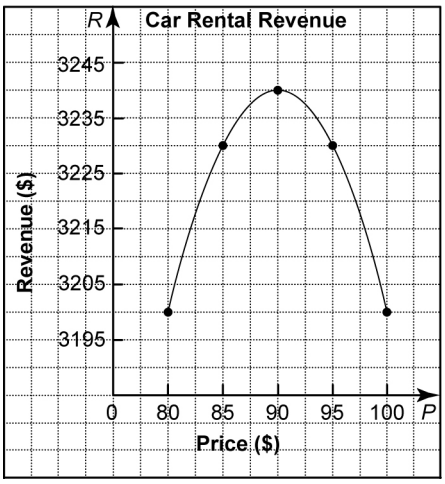
reflected in the *x*-axis, vertically compressed by a factor of 4.9, translated up 45 units
b) 49 m **c)** 19.6 m

8. a) $y = –0.086(x – 22)^2 + 42$ **b)** 44.1 m

9. a)

Price ($)	Cars Rented	Revenue ($)
80	40	3200
85	38	**3230**
90	**36**	**3240**
95	**34**	**3230**
100	**32**	**3200**

b)



c) $90 **d)** $3240

BLM 4-13 Chapter 4 Test

1. D **2.** D **3.** B **4.** A **5.** C

6. quadratic: **a), d);** a) has an x^2 term in the equation; **d)** has constant second differences

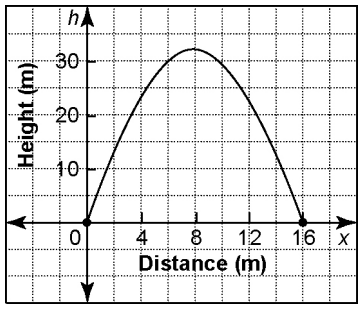
7. a) opens upward, vertically stretched by a factor of 2, translated 2 units left
b) opens downward, vertically compressed by a factor of 0.5, translated 3 units down
c) opens upward, translated 3 units right and 8 units up
d) opens downward, vertically stretched by a factor of 3, translated 1 unit right and 2 units down

8. a) first relation **b)** both are on the y-axis
c) second relation **d)** both are same distance

9. a) both are on the x-axis **b)** both are same distance
c) first relation **d)** second relation

10. a) $y = 1.5(x - 10)^2 + 2$ **b)** 3.5 m **c)** 2 m; 10 m

11. a)



b) (8, 32); The maximum height of 32 m occurs 8 m from the base of the arch.
c) 14 m
d) Yes. The tunnel is 16 m wide and 32 m high; the 8 m by 23 m crate will fit through the tunnel.