Page 157 part 2 # 5, 8-10, 12, 13, 18, 20

5.

> Because the information is given on a graph I am going to use the "inspection" method to find a value for "a" in the equation. Compare the distance up from the vertex to the next point to see how much stretch there is.

a) y_1 : • from the vertex you go "right 1" then "up 1" to get to the next point so $a = 1$
- the vertex is at $(0,0)$ so there has been no horizontal or vertical shifting
- so $y_1 = 1(x-0)^2 + 0$
  simplify $y_1 = x^2$

y_2 : • from the vertex you go "right 1" then "up 4" to get to the next point so $a = 4$ because the "up" is 4 times the 1 that it should be
- the vertex has been shifted up 2 so $q = 2$
- so $y_2 = 4(x-0)^2 + 2$
  simplify $y_2 = 4x^2 + 2$

y_3 : • from the vertex you go "right 2" then "up 2" to get to the next point - it should be up 4" so $a = \frac{2}{4} = \frac{1}{2}$
- the vertex has been shifted down 2 so $q = -2$
- so $y_3 = \frac{1}{2}(x-0)^2 + (-2)$
  simplify $y_3 = \frac{1}{2}x^2 - 2$

y_4 : • from the vertex you go "right 2" then "up 1" to get to the next point - it should be "up 4" so $a = \frac{1}{4}$
- the vertex has been shifted down 4 so $q = -4$
- so $y_4 = \frac{1}{4}(x-0)^2 + (-4)$
  simplify $y_4 = \frac{1}{4}x^2 - 4$

page 157 part 2 cont.

5. b) $y_1 = -x^2$ $y_3 = -\frac{1}{2}x^2 - 2$
   $y_2 = -4x^2 + 2$ $y_4 = -\frac{1}{4}x^2 - 4$

c) (a move left from the y-axis means that $p = -4$)

$y_1 = (x - -4)^2$ $y_2 = 4(x - -4)^2 + 2$
$y_1 = (x + 4)^2$ $y_2 = 4(x + 4)^2 + 2$

$y_3 = \frac{1}{2}(x - -4)^2 - 2$ $y_4 = \frac{1}{4}(x - -4)^2 - 4$
$y_3 = \frac{1}{2}(x + 4)^2 - 2$ $y_4 = \frac{1}{4}(x + 4)^2 - 4$

d) (a translation (another word for "shift") down means q will be 2 less than it currently is)

$y_1 = x^2 - 2$ $y_2 = 4x^2 + 2 - 2$
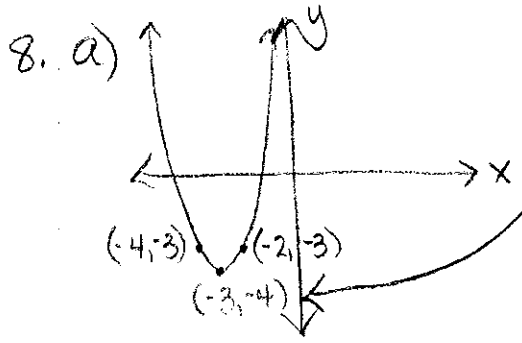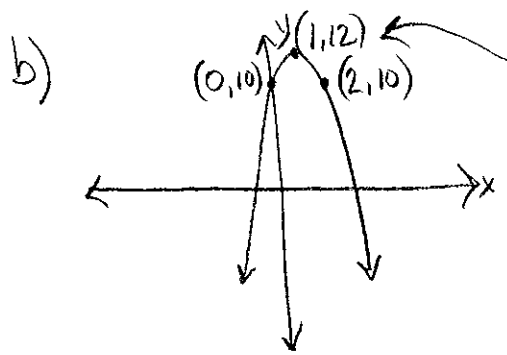 $y_2 = 4x^2$

$y_3 = \frac{1}{2}x^2 - 2 - 2$ $y_4 = \frac{1}{4}x^2 - 4 - 2$
$y_3 = \frac{1}{2}x^2 - 4$ $y_4 = \frac{1}{4}x^2 - 6$

8. a)

(-4, -3) (-2, -3)
(-3, -4)

$p = -3$, $q = -4$

over 1, up 1 is standard
so $a = 1$
$y = 1(x - -3)^2 + (-4)$
$y = (x + 3)^2 - 4$

Memorize!

x	y
1	1
2	4
3	9

$y = x^2$
Standard form!

b)

(0,10) y(1,12) (2,10)
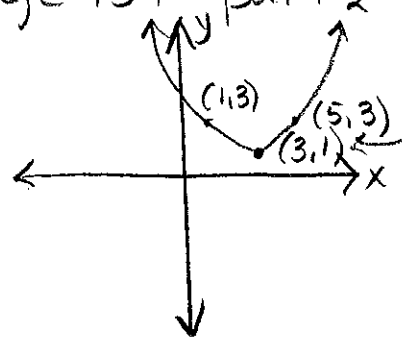
$p = 1$, $q = 12$

over 1, down 2 - double what it
is supposed to be so $a = 2$
opens down so a is negative

$y = -2(x - 1)^2 + 12$

8. **page 157 part 2 cont.**

c)

$p = 3$, $q = 1$

over 2, up 2 - $\frac{1}{2}$ of what it should
be so $a = \frac{1}{2}$

opens up so a is positive

$$y = \frac{1}{2}(x-3)^2 + 1$$

should be
4 and it's 2
$$\frac{2}{4} = \frac{1}{2}$$

d)

$p = -3$, $q = 4$

over 2, down 1 - should be
down 4 so it's $\frac{1}{4}$, $a = \frac{1}{4}$
opens down so a is negative

$$y = -\frac{1}{4}(x - -3)^2 + 4$$
$$y = -\frac{1}{4}(x + 3)^2 + 4$$

9. a) vertex $(\overset{p}{0}, \overset{q}{0})$ point $(\overset{x}{6}, \overset{y}{-9})$

$-9 = a(6-0)^2 + 0$

$-9 = 36a$

$\dfrac{-9}{36} = a$

$-\dfrac{1}{4} = a$

$$y = -\frac{1}{4}(x-0)^2 + 0$$

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

b) vertex $(\overset{p}{0}, \overset{q}{-6})$ point $(\overset{x}{3}, \overset{y}{21})$

$21 = a(3-0)^2 + (-6)$

$21 = 9a - 6$

$27 = 9a$

$3 = a$

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

Page 157 part 2 cont.

9. b) Vertex $(\underset{p}{2}, \underset{q}{5})$ Point $(\underset{x}{4}, \underset{y}{-11})$

$-11 = a(4-2)^2 + 5$ 　　　　 $y = -4(x-2)^2 + 5$
$-11 = 4a + 5$
$-16 = 4a$
$-4 = a$

d) Vertex $(\underset{p}{-3}, \underset{q}{-10})$ Point $(\underset{x}{2}, \underset{y}{-5})$
$-5 = a(2--3)^2 - 10$
$-5 = 25a - 10$
$5 = 25a$
$\dfrac{5}{25} = a$ 　　　　　 $y = \dfrac{1}{5}(x--3)^2 - 10$

$\dfrac{1}{5} = a$ 　　　　　 $y = \dfrac{1}{5}(x+3)^2 - 10$

10. $(4, 16)$

a) left 5: $4-5=-1$
   up 8: $16+8=24$ 　　　　 $(-1, 24)$

b) mult y-values by $\dfrac{1}{4}$: $16\left(\dfrac{1}{4}\right) = 4$
   reflect across x-axis: 4 below x-axis is -4 　$(4, -4)$

c) reflect across x-axis: 16 below x-axis is -16
   right 10: $4+10=14$ 　　　　 $(14, -16)$

d) mult. y-values by 3: $16 \cdot 3 = 48$
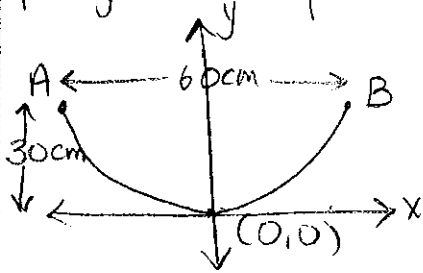   down 8: $48-8=40$ 　　　　 $(4, 40)$

12. All quadratic functions have 1 y-intercept.
   • one arm only can cross
   • the arm can cross only once
   • one arm <u>must</u> cross

page 157 part 2 cont.

13.

$p = 0, \ q = 0$
over 30, up 30   but it should
be up 900 so $a = \dfrac{30}{900} = \dfrac{1}{30}$
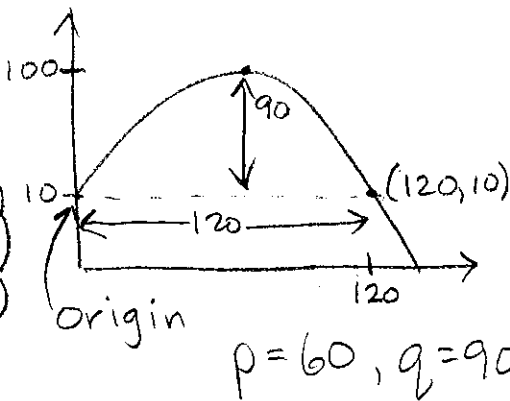
$y = \dfrac{1}{30}(x-0)^2 + 0$

$y = \dfrac{1}{30}x^2$

b) A is the origin: $y = \dfrac{1}{30}(x-30)^2 - 30$

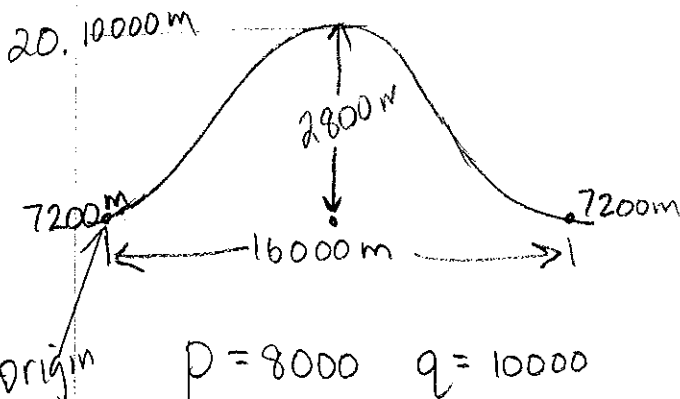B is the origin: $y = \dfrac{1}{30}(x+30) - 30$

shape stays the same

18.

drawing not to scale!

$p = 60, \ q = 90$

from vertex: over 60, down 90
should be down 3600 so
$a = -\dfrac{90}{3600} = \dfrac{-1}{40}$

$y = \dfrac{-1}{40}(x-60)^2 + 90$

I think the text answer is wrong

20.

$p = 8000 \quad q = 10000$

from vertex: over 8000, down 2800
should be down 64 000 000 so
$a = -\dfrac{2800}{64 000 000} = \dfrac{-7}{160 000}$

$y = \dfrac{-7}{160 000}(x-8000)^2 + 10000$