

Before we begin, are there any questions from last day's work?

Today's Learning Goal(s):

Math Contests??

By the end of the class, I will be able to:

- a) consolidate understanding of **graphing** and **determining an equation** of a quadratic relation in vertex form: $y = a(x - h)^2 + k$

Today's plan:

Show What You Know 4.1: Graphing Quadratic Relations

Complete "Learning Skills" self-assessment

Not Done Fall 2016

Correct yesterday's homework

pp. 185-187 #3 to 6, 7ab, 9, 11, 12, 14



Enrichment: pp. 186-188 #8, 10, 13, 15, 20

Today's work:

Wkst 4.4 BLM

Worksheet and Answers follow

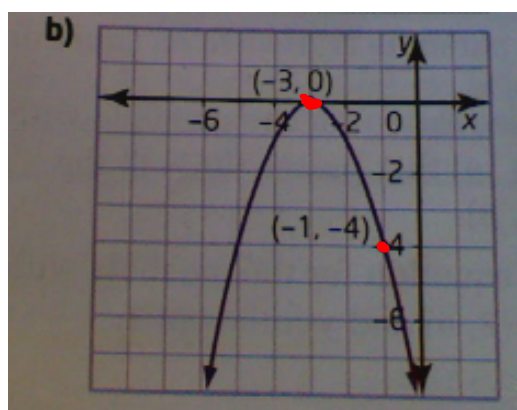
(1&2*)fghij, 3 to 8, 9bcde, 10, 11

*for 2 graph *by hand*

p. 185 #6b

$$v(-3, 0)$$

$$y = a(x-h)^2 + k$$



$$y = a(x+3)^2 + 0$$

pt $(-1, -4)$

$$(-4) = a(-1+3)^2$$

$$-4 = a(2)^2$$

$$-4 = 4a$$

$$\rightarrow \therefore a = -1$$

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

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

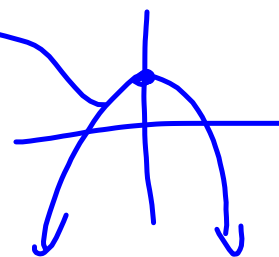
p. 186 #9

reflected in x-axis \rightarrow a is negativeCompressed vertically by a factor of $\frac{1}{2}$ wider
translated 2 units upwards $\hookrightarrow a = \frac{1}{2}$

$$y = a(x-h)^2 + k \quad \rightarrow \quad k = 2$$

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

$$= -\frac{1}{2}x^2 + 2$$

 $v(0, 2)$ 

$$\frac{\cancel{7}^1}{\cancel{22}^2} \times \frac{5}{\cancel{6}^3} \times \frac{\cancel{8}^2}{\cancel{3}^1} \times \frac{\cancel{11}^1}{\cancel{14}^2} \times \frac{\cancel{5}^1}{\cancel{4}^1} \times \frac{\cancel{9}^3}{\cancel{10}^2}$$

$$= \frac{5}{8}$$

$$= \frac{138600}{221760}$$

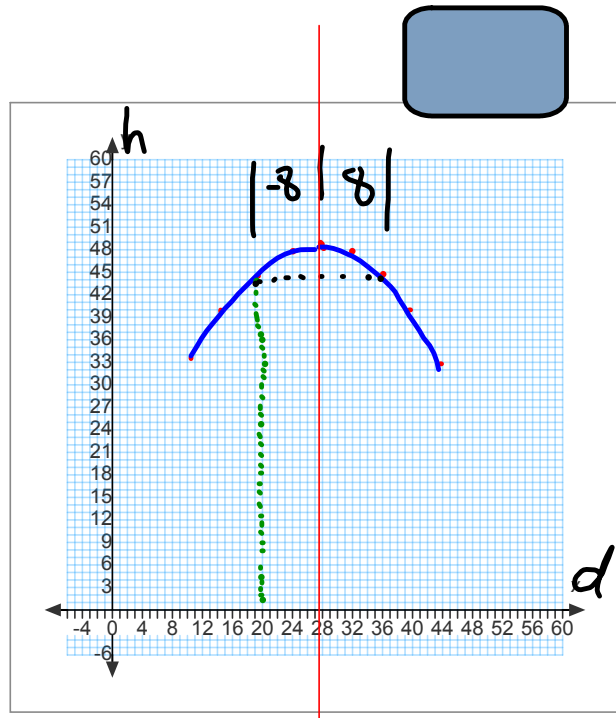
p. 187 #12

$$h = -\frac{1}{16}(d-28)^2 + 49$$

$$V(28, 49)$$

b) max height of the ball is 49m

c) when does max occur?
when $d=28m$

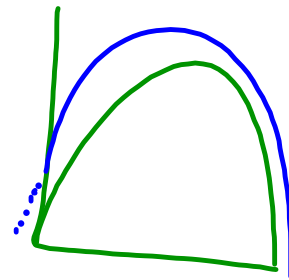


d) if $d=20$

$$h = -\frac{1}{16}(20-28)^2 + 49$$

$$= -\frac{1}{16}(-8)^2 + 49$$

$$\begin{aligned} \frac{-1}{16}(64) + 49 & \rightarrow = -4 + 49 \\ & = 45m \end{aligned}$$



$$\begin{aligned} h &= -\frac{1}{16}(d-28)^2 + 49 \\ &= -\frac{1}{16}(0-28)^2 + 49 \\ &= -\frac{1}{16}(784) + 49 \\ &= -49 + 49 \\ &= 0 \end{aligned}$$

$$a = -\frac{1}{16}$$

1
2
3
4
5
6
7
8

1
4
9
16

~~16~~

1	1	1/16
2	4	4/16
3	9	9/16
4	16	16/16
5		1
6		
7		
8		

4



p. 187 #14

$$h = -5(t - 5)^2 + 127$$

$$V(5, 127)$$

a) max. height = 127 m

time to reach max. height = 5 s



b)

$$h = -5(t - 5)^2 + 127$$

let $t = 0$

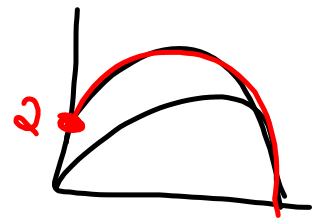
$$h = -5(0 - 5)^2 + 127$$

$$= -5(-5)^2 + 127$$

$$= -5(25) + 127$$

$$= -125 + 127$$

$$= 2 \text{ m}$$



4.4 Graph $y = a(x-h)^2 + k$ *Principles of Mathematics 10, pages 180–188***A**

1. Copy and complete the table for each parabola. Replace the heading for the second column with the equation for the parabola.

Property	$y = a(x-h)^2 + k$
Vertex	
Axis of symmetry	
Stretch or compression factor relative to $y = x^2$	
Direction of opening	
Values x may take	
Values y may take	

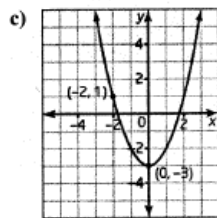
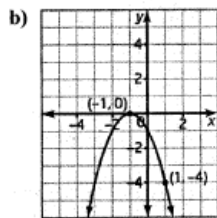
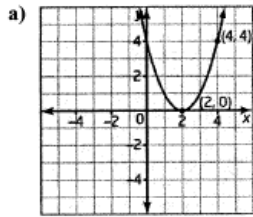
- a) $y = (x + 3)^2$
 b) $y = (x - 4)^2$
 c) $y = (x + 2)^2 + 5$
 d) $y = (x + 5)^2 - 3$
 e) $y = (x - 6)^2 + 7$
 f) $y = (x - 1)^2 - 8$
 g) $y = -(x + 8)^2 - 4$
 h) $y = 3(x + 7)^2 - 2$
 i) $y = -2(x + 3)^2 - 6$
 j) $y = -\frac{1}{2}(x + 5)^2 - 3$

2. **Use Technology** Graph each parabola in question 1 using a graphing calculator.

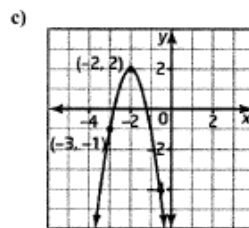
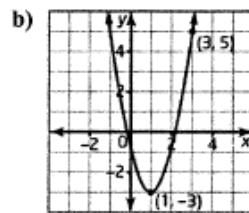
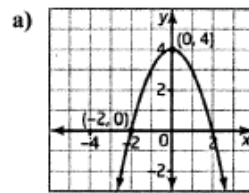
B

3. Write an equation for the parabola with vertex $(3, 5)$, opening upward, and with no vertical stretch or compression.
4. Write an equation for the parabola with vertex $(6, -2)$, opening downward, and with no vertical stretch or compression.
5. Write an equation for the parabola with vertex $(-4, 5)$, opening downward, and with a vertical stretch of factor 3.
6. Write an equation for the parabola with vertex $(-1, -7)$, opening upward, and with a vertical compression of factor 0.4.

7. Write an equation for each parabola.



8. Write an equation for each parabola.



9. a) Find an equation for the parabola with vertex $(2, 6)$ that passes through the point $(5, 3)$.
- b) Find an equation for the parabola with vertex $(-3, -4)$ that passes through the point $(2, 6)$.
- c) Find an equation for the parabola with vertex $(-1, 3)$ and x -intercept 1 .
- d) Find an equation for the parabola with vertex $(2, 5)$ and y -intercept -3 .
- e) Find an equation for the parabola with vertex $(-6, -2)$ that passes through the point $(-3, -11)$.
- f) Find an equation for the parabola with vertex $(6, 4)$ that passes through the point $(8, 2)$.

11. A parabola has equation $y = 3(x + 2)^2 + 4$. Write an equation for the parabola after each set of transformations.
- a) a reflection in the x -axis
- b) a translation 6 units to the right
- c) a reflection in the x -axis, followed by a translation of 3 units downward
- d) a reflection in the y -axis

C

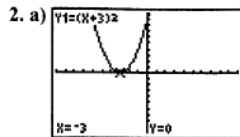
10. The path of a football is modelled by the relation $h = -\frac{1}{4}(d - 12)^2 + 36$, where d is the horizontal distance, in metres, after it was kicked, and h is the height, in metres, above the ground.
- a) Sketch the path of the football.
- b) What is the maximum height of the football?
- c) What is the horizontal distance when this occurs?
- d) What is the height of the football at a horizontal distance of 10 m?
- e) Find another horizontal distance where the height is the same as in part d).

12. Find the equation for each of the following circles. Write your answer in the form $(x - h)^2 + (y - k)^2 = r^2$.
- a) radius 4, centred at $(6, 0)$
- b) radius 5, centred at $(0, -2)$
- c) radius 3, centred at $(-7, 3)$
- d) radius 6, centred at $(-5, -4)$

4.4 Graph $y = a(x-h)^2 + k$, pages 41-42

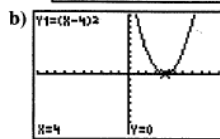
1. a)

Property	$y = (x+3)^2$
Vertex	$(-3, 0)$
Axis of symmetry	$x = -3$
Stretch or compression factor relative to $y = x^2$	none
Direction of opening	upward
Values x may take	set of real numbers
Values y may take	$y \geq 0$



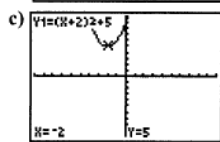
b)

Property	$y = (x-4)^2$
Vertex	$(4, 0)$
Axis of symmetry	$x = 4$
Stretch or compression factor relative to $y = x^2$	none
Direction of opening	upward
Values x may take	set of real numbers
Values y may take	$y \geq 0$



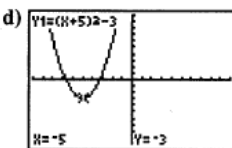
c)

Property	$y = (x+2)^2 + 5$
Vertex	$(-2, 5)$
Axis of symmetry	$x = -2$
Stretch or compression factor relative to $y = x^2$	none
Direction of opening	upward
Values x may take	set of real numbers
Values y may take	$y \geq 5$



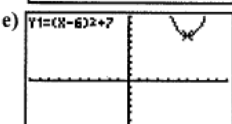
d)

Property	$y = (x+5)^2 - 3$
Vertex	$(-5, -3)$
Axis of symmetry	$x = -5$
Stretch or compression factor relative to $y = x^2$	none
Direction of opening	upward
Values x may take	set of real numbers
Values y may take	$y \geq -3$



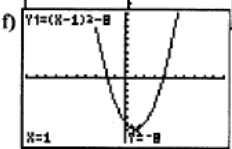
e)

Property	$y = (x-6)^2 + 7$
Vertex	$(6, 7)$
Axis of symmetry	$x = 6$
Stretch or compression factor relative to $y = x^2$	none
Direction of opening	upward
Values x may take	set of real numbers
Values y may take	$y \geq 7$



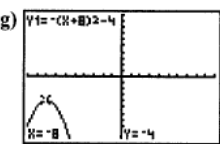
f)

Property	$y = (x-1)^2 - 8$
Vertex	$(1, -8)$
Axis of symmetry	$x = 1$
Stretch or compression factor relative to $y = x^2$	none
Direction of opening	upward
Values x may take	set of real numbers
Values y may take	$y \geq -8$



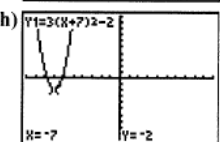
g)

Property	$y = -(x+8)^2 - 4$
Vertex	$(-8, -4)$
Axis of symmetry	$x = -8$
Stretch or compression factor relative to $y = x^2$	none
Direction of opening	downward
Values x may take	set of real numbers
Values y may take	$y \leq -4$



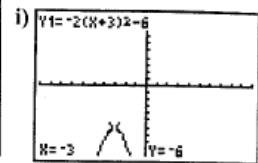
h)

Property	$y = 3(x+7)^2 - 2$
Vertex	$(-7, -2)$
Axis of symmetry	$x = -7$
Stretch or compression factor relative to $y = x^2$	3
Direction of opening	upward
Values x may take	set of real numbers
Values y may take	$y \geq -2$



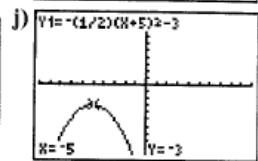
i)

Property	$y = -2(x+3)^2 - 6$
Vertex	$(-3, -6)$
Axis of symmetry	$x = -3$
Stretch or compression factor relative to $y = x^2$	2
Direction of opening	downward
Values x may take	set of real numbers
Values y may take	$y \leq -6$



j)

Property	$y = \frac{1}{2}(x+5)^2 - 3$
Vertex	$(-5, -3)$
Axis of Symmetry	$x = -5$
Stretch or compression factor relative to $y = x^2$	$\frac{1}{2}$
Direction of opening	downward
Values x may take	set of real numbers
Values y may take	$y \leq -3$



3. $y = (x - 3)^2 + 5$

4. $y = -(x - 6)^2 - 2$

5. $y = -3(x + 4)^2 + 5$

6. $y = 0.4(x + 1)^2 - 7$

7. a) $y = (x - 2)^2$

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

c) $y = x^2 - 3$

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

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

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

9. a) $y = -\frac{1}{3}(x - 2)^2 + 6$

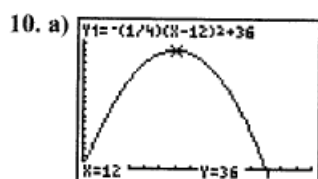
b) $y = \frac{2}{5}(x + 3)^2 - 4$

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

d) $y = -2(x - 2)^2 + 5$

e) $y = -(x + 6)^2 - 2$

f) $y = -\frac{1}{2}(x - 6)^2 + 4$



b) 36 m

c) 12 m

d) 35 m

e) 14 m

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

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

c) $y = -3(x + 2)^2 - 7$

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

12. a) $(x - 6)^2 + y^2 = 16$

b) $x^2 + (y + 2)^2 = 25$

c) $(x + 7)^2 + (y - 3)^2 = 9$

d) $(x + 5)^2 + (y + 4)^2 = 36$