

Today's Learning Goal(s):

Date: _____

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

- understand the properties of families quadratic functions.
- write a quadratic equation that represents a family of curves.
- find a specific member of a family of curves.

Are there any questions from last day's assigned work you would like to see on the board?

Last day's Assigned Practice: pp. 185-186 #1bde, 3ac, 4ac, 6, 7 [14,17,18]

p. 185

7. For what value(s) of k will the function $f(x) = kx^2 - 4x + k$ have no zeros?

Set the condition FIRST $a=k$ $b=-4$ $c=k$

$$b^2 - 4ac < 0$$

$$(-4)^2 - 4(k)(k) < 0$$

$$16 - 4k^2 < 0$$

$$4(4 - k^2) < 0$$

$$4(2 - k)(2 + k) < 0$$

1st true | 2nd -ve

$$2 - k > 0 \quad \text{AND} \quad 2 + k < 0$$

$$-k > -2 \quad k < -2$$

$$k < \frac{-2}{-1}$$

$$k < 2$$



OR

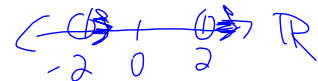
1st -ve, 2nd true

$$2 - k < 0 \quad \text{AND} \quad 2 + k > 0$$

$$-k < -2 \quad k > -2$$

$$k > \frac{-2}{-1}$$

$$k > 2$$

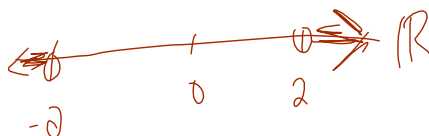


both true $k > 2$

Both true

when $k < -2$

OR



p. 186

14. If $f(x) = x^2 - 6x + 14$ and $g(x) = -x^2 - 20x - k$, determine the value of k so that there is exactly one point of intersection between the two parabolas.

$$\rightarrow \therefore b^2 - 4ac = 0$$

if intersection, then $f(x) = g(x)$

$$\therefore x^2 - 6x + 14 = -x^2 - 20x - k$$

$$x^2 + x^2 - 6x + 20x + 14 + k = 0$$

$$2x^2 + 14x + 14 + k = 0$$

$$\therefore a = 2 \quad b = 14 \quad c = 14 + k$$

$$b^2 - 4ac = 0$$

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- a) understand the properties of families quadratic functions.
- b) write a quadratic equation that represents a family of curves.
- c) find a specific member of a family of curves.

Last day's work:

full solutions posted online => Quadrac Funcons Wkst #1, 1 – 8
(Optional Wksts 15.7, 14.18)

Friday's work: pp. 185-186 #1bde, 3ac, 4ac, 6, 7 [14,17,18]

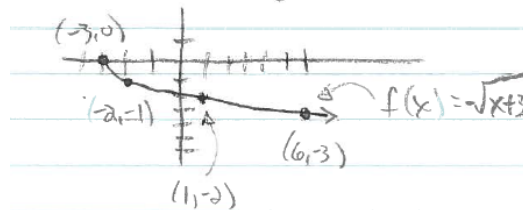
(See 3.6 Homework Corrections)

Wkst #1, 4b

4. Graph $f(x) = -\sqrt{x+3}$ and determine
- a) the domain and range of $f(x)$.
 - b) the equation of f^{-1}

4. $f(x) = -\sqrt{x+3}$

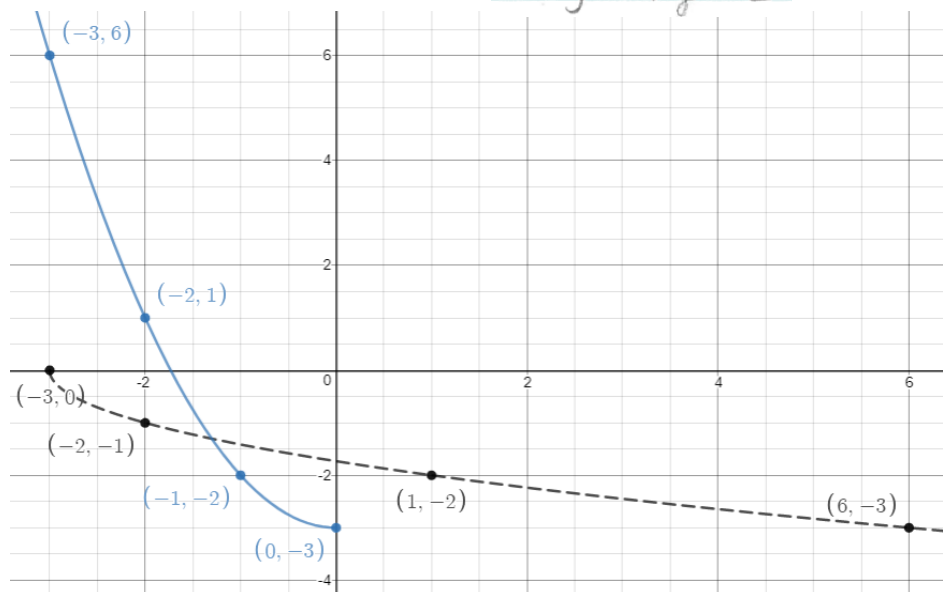
a) $D = \{x \in \mathbb{R} \mid x \geq -3\}$
 $R = \{y \in \mathbb{R} \mid y \leq 0\}$



b) $x = -\sqrt{y+3}$
 $-x = \sqrt{y+3}$
 $(-x)^2 = y+3$
 $x^2 - 3 = y$

$\therefore f^{-1}(x) = x^2 - 3, x \leq 0$
 $D = \{x \in \mathbb{R} \mid x \leq 0\}$
 $R = \{y \in \mathbb{R} \mid y \geq -3\}$

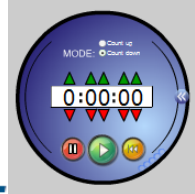
1 $y = -\sqrt{x+3} \{x \geq -3\}$
 2 $y = x^2 - 3 \{x \leq 0\}$



3.7 Families of Quadratic Functions

Date: Oct, 11/19

For the next 15 minutes, with a partner, work on p. 187 A - J

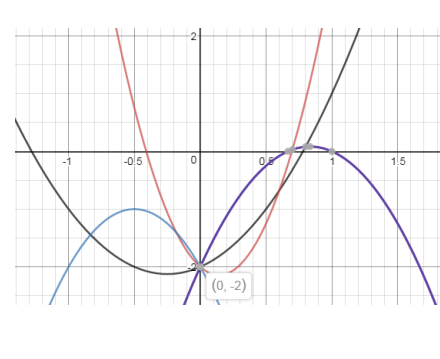
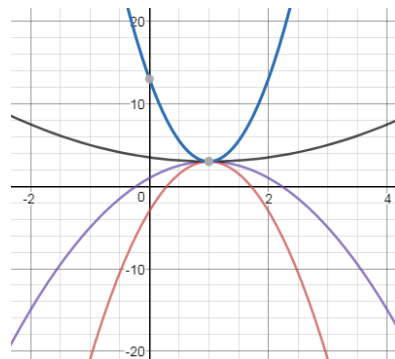
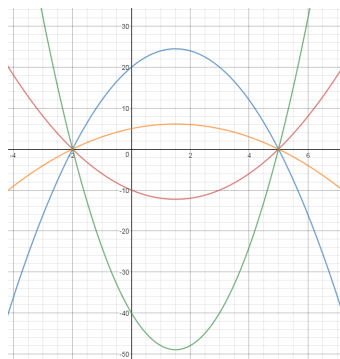


Use **desmos** on your Chromebook!
(3.7 Investigate)

INVESTIGATE the Math

Equations that define quadratic functions can look quite different, yet their graphs can have similar characteristics.

| Group 1 | Group 2 | Group 3 |
|-----------------------------|----------------------------|-------------------------|
| $f(x) = x^2 - 3x - 10$ | $m(x) = -2x^2 + 4x + 1$ | $r(x) = -3x^2 + 5x - 2$ |
| $g(x) = -2x^2 + 6x + 20$ | $n(x) = 0.5x^2 - 1x + 3.5$ | $s(x) = 2x^2 + x - 2$ |
| $h(x) = 4x^2 - 12x - 40$ | $p(x) = -6x^2 + 12x - 3$ | $t(x) = 7x^2 - 2x - 2$ |
| $k(x) = -0.5x^2 + 1.5x + 5$ | $q(x) = 10x^2 - 20x + 13$ | $u(x) = -4x^2 - 4x - 2$ |



Summary of Invesgaon (p. 187):

$$f(x) = a(x - r)(x - s)$$

$$f(x) = a(x + 2)(x - 5)$$

$$f(x) = a(x - d)^2 + c$$

$$f(x) = a(x - 1)^2 + 3$$

$$f(x) = ax^2 + bx + c$$

$$f(x) = ax^2 + bx - 2$$

all have the same **roots/x-ints**
stretch/compression differs

all have the same **vertex**
stretch/compression differs

all have the same **y-intercept**
stretch/compression differs

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3.7 Families of Quadratic Functions

Date: Oct, 11/19

Ex.1: Determine the equation of the quadratic function that passes through $(-3, 20)$ if its zeros are 4 and -1 .

(working backwards) if the zeros are 4 and -1 .
 then $x = 4$ and $x = -1$
 $x - 4 = 0$ and $x + 1 = 0$
 $f(x) = a(x - 4)(x + 1)$
 $(20) = a(-3 - 4)(-3 + 1)$
 $20 = a(-7)(-2)$
 $20 = 14a$
 $\frac{20}{14} = a$
 $\frac{10}{7} = a$

$$y = x^2 - 6x + 5$$

$$= (x - 5)(x - 1)$$

↓
 $x = 5$ or $x = 1$

$f(x) = \frac{10}{7}(x - 4)(x + 1)$ is the equation of the parabola.

Ex.2: A tunnel with a parabolic arch is 14m wide. The edge of the arch is at the origin, and a point 4 m from the edge of the arch is 10m high.

a) What is the equation of the parabola?

WIK: point (4,10) $r=0$ $s=14$

$$f(x) = a(x-r)(x-s)$$

$$f(x) = a(x-0)(x-14)$$

$$10 = a(4-0)(4-14)$$

$$10 = a(4)(-10)$$

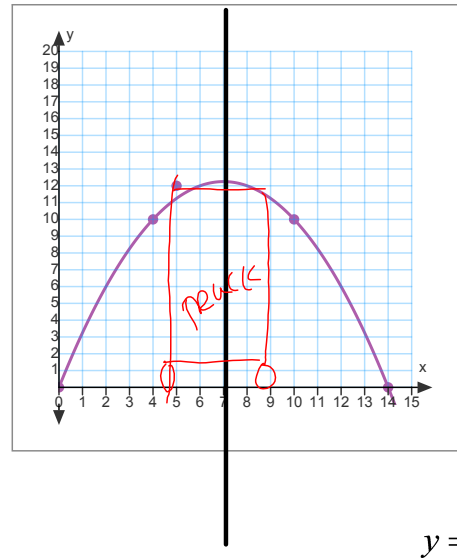
$$10 = -40a$$

$$\frac{10}{-40} = a$$

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

$f(x) = -\frac{1}{4}x(x-14)$ is the equation of the parabola.

(4,12)



b) Will a truck that is 12 m high and 4 m wide fit under the arch?
Justify your answer.

Check 2 m on each side of the centre (ie. A of S: $x=7$)

If the height at $x=5$ (and also $x=9$) is more than 12 m, then the truck WILL fit.

$$f(5) = -\frac{1}{4}(5)(5-14)$$

$$= -\frac{1}{4}(5)(-9)$$

$$= \frac{45}{4}$$

$$= 11\frac{1}{4} \text{ m}$$

$f(5)$ is the height of the tunnel at 5 m from the origin.

$$\therefore f(5) = 11\frac{1}{4}$$

and the truck is 12 m high (at $5 \leq x \leq 9$)

\therefore the truck will NOT fit $(\because 11\frac{1}{4} < 12)$
↑
req'd

Are there any questions from last day's assigned work you would like to see on the board?

Last day's Assigned Practice: pp. 185-186 #1bde, 3ac, 4ac, 6, 7 [14,17,18]

Today's Assigned Practice includes:

READ pp. 188-191

SWYK 3.2 Tuesday

p. 192 #1 – 3, 4ac, 5ac, 6, 8, 10