1.2:
- #15-29odd (determining if a relation is a function; determining function values)
- #40,41,42,45,48 (determining domain of a function)
- #59-70all (determining if a graph is a function; domain & range from graph)

1.4:
- #35-47odd; 53-63odd (determining equations of lines; parallel v. perpendicular)

1.5:
- #1-16all (determining characteristics of functions from graphs)
- #47-61odd (determining function values of & graphing piecewise functions)
- #69-74all (finding domain, range & equation given graph of a piecewise function)

1.6: #23,29,31; 45, 49, 51; 63, 71,75; 81, 83 (algebra of functions)

1.7: #9,11,21,23; 39-47odd (symmetry tests)

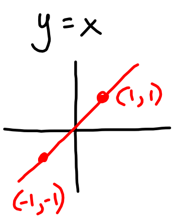
#59-69odd; 77-83 odd; 93-101odd; 115-121odd (graphing with transformations)

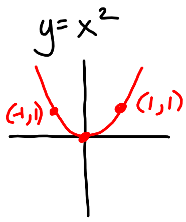
2.4: #1,2; 15-22all; 23-27odd (parabolas)

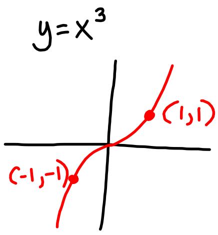
2.4: #3-13 odd

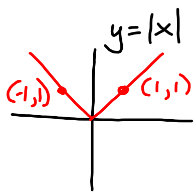
Friday - class is cancelled

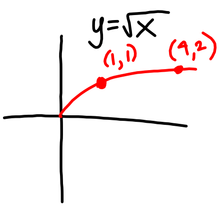
Test #1 - Tues. 11/29

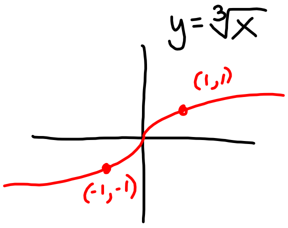


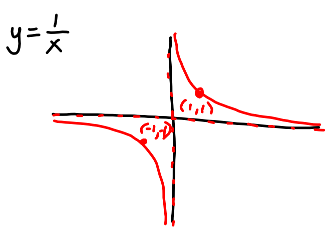












Graphing by transformations

$y = f(x) \Rightarrow y = af[bx+c] + d$

$y = af\left[b\left(x+\frac{c}{b}\right)\right] + d$

a = vertical shrink/stretch
- If $|a|>1$ stretch
- If $|a|<1$ shrink
- If $a<0$ vertical flip

b = horizontal shrink/stretch
- If $|b|>1$ shrink
- If $|b|<1$ stretch
- If $b<0$ horizontal flip

$\frac{c}{b}$ = horizontal shift
- If $\frac{c}{b}>0$ left
- If $\frac{c}{b}<0$ right

d = vertical shift
- If $d>0$ up
- If $d<0$ down

$y = \boxed{a} f(\boxed{b}x + c) + d$

vertical scale

horizontal scale

apply by dividing x-coord's by b

multiply y-coord's by a to apply

1.7

96. $y=x^3$

upside down

right 5

$f(x) = -(x-5)^3$

100. $y=|x|$

stretched horiz. by 2

down 5

$f(x) = \left|\frac{1}{2}x\right| - 5$

$\left(= \frac{1}{2}|x| - 5\right)$

$f(x) = \frac{1}{x}$

- vertical flip
- vertical stretch by 3

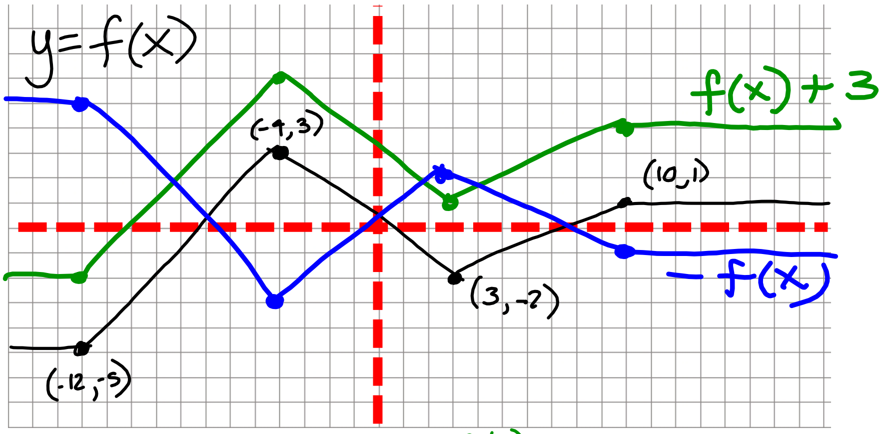
horizontal shrink by 2

left 5

up 7

$f(x) = -3 \cdot \frac{1}{2(x+5)} + 7$

$\boxed{f(x) = \frac{-3}{2x+10} + 7}$



$y = f(x) + 3$

$y = -f(x)$

2.4 - Analyzing Graphs of Quadratic Functions

Standard form: $\boldsymbol{f(x) = ax^2 + bx + c}$

The graph of a quadratic function is a parabola.

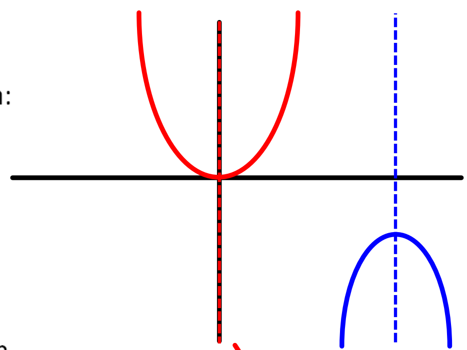
We can rewrite the standard form into a more useful form:

$\boxed{\boldsymbol{f(x) = a(x-h)^2 + k}}$, where

Vertex: (h, k)

Axis of symmetry: $x = h$

(vertical line through the vertex)



If $a > 0$, parabola opens upward, vertex is a minimum

range: $[k, \infty)$ decr: $(-\infty, h)$ incr: (h, ∞)

If $a < 0$, parabola opens downward, vertex is a maximum

range: $(-\infty, k]$ incr: $(-\infty, h)$ decr (h, ∞)

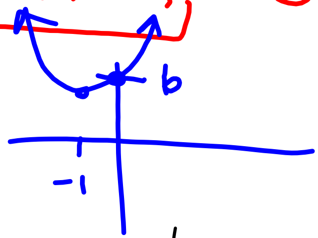
2.4

$(a+b)^2 = a^2+2ab+b^2$

$(a-b)^2 = a^2-2ab+b^2$

8. $f(x) = x^2+2x+6 = x^2+2x+1 + 5$

$f(x) = (x+1)^2+5$



vertex: $(-1, 5)$

opens: up

axis of symmetry: $x=-1$

increasing: $(-1, \infty)$

decreasing: $(-\infty, -1)$

domain: $(-\infty, \infty)$

range: $[5, \infty)$

abs max: N/A

abs min: 5 @ $x=-1$

12. $f(x) = 2x^2-10x+14$ Completing the Square

Step 1: factor x^2-coefficient out of x^2 & x terms only

$f(x) = 2(x^2-5x\ \ ) + 14$

Step 2: take $\frac{1}{2}$ of x-coefficient and square it

$\left(\frac{1}{2}(-5)\right)^2 = \left(-\frac{5}{2}\right)^2 = \frac{25}{4}$

Step 3: add that number inside the parentheses, and subtract that number times any x^2-coeff that was factored out previously outside the parentheses

$f(x) = 2\left(x^2-5x+\frac{25}{4}\right)+14-2\left(\frac{25}{4}\right)$

Step 4: rewrite perfect square trinomial in parentheses as $(x-h)^2$ and combine constants outside the function

$f(x) = 2\left(x-\frac{5}{2}\right)^2+\frac{28}{2}-\frac{25}{2}$

$f(x) = 2\left(x-\frac{5}{2}\right)^2+\frac{3}{2}$

vertex: $(5/2, 3/2)$

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

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

$\left[\frac{1}{2}(1)\right]^2 = \frac{1}{4}$ $\quad 1 + \frac{3}{4}$

$= -3\left(x + \frac{1}{2}\right)^2 + \frac{7}{4}$

vertex: $(-1/2, 7/4)$

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

vertex: $\left(\frac{-b}{2a}, f\left(\frac{-b}{2a}\right)\right)$

$ax^2 + bx + c$

$\frac{-b}{2a} = \frac{-(-3)}{2(-3)} = \frac{-1}{2}$

$f\left(-\frac{1}{2}\right) = -3\left(-\frac{1}{2}\right)^2 - 3\left(-\frac{1}{2}\right) + 1 = \frac{-3}{4} + \frac{3}{2} + 1$

$= \frac{-3}{4} + \frac{6}{4} + \frac{4}{4}$

$= 7/4$

vertex

$(-1/2, 7/4)$

$f(x) = ax^2 + bx + c$ VERSUS $f(x) = a(x-h)^2 + k$

y-intercept is $(0,c)$
easier? to solve (if factorable)
$ax^2+bx+c=0$
to get x-intercepts
$(x_1,0)$ & $(x_2,0)$

vertex: (h,k)
axis of sym: $x=h$
range: $[k,\infty)$, $a>0$
$(-\infty,k]$, $a<0$

good for graphing

zeros of a function versus x-intercepts of a function

x is a zero of a function *f* if *f(x)=0*
That is, zeros of a function are all of the input values that have 0 as their output.

(x,0) is an x-intercept of a function *f* if the graph of *f* intersects the x-axis at the point *(x,0)* .

Since the x-coordinates of the x-intercepts are exactly those input values that map to 0, we can get our x-intercepts from our list of zeros.
Note, however, that*only real zeros contribute to x-intercepts*

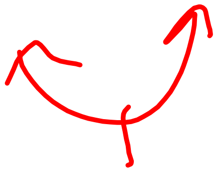
$f(x) = 3x^2 - x + 5$

vertex: $\frac{-(-1)}{2(3)} = \left(\frac{1}{6}, \frac{59}{12}\right)$

$f\left(\frac{1}{6}\right) = 3\left(\frac{1}{6}\right)^2 - \frac{1}{6} + 5$

$= \frac{1}{12} - \frac{2}{12} + \frac{60}{12}$

x-int: ~~solve $3x^2 - x + 5 = 0$~~



vertex: $\left(\frac{1}{6}, \frac{59}{12}\right)$

axis of symmetry: $x = 1/6$

y-intercept: $(0, 5)$

x-intercept(s): N/A

domain: $(-\infty, \infty)$

range: $\left[\frac{59}{12}, \infty\right)$

max/min? $\frac{59}{12}$ @ $x = \frac{1}{6}$

increasing on: $(1/6, \infty)$

decreasing on: $(-\infty, 1/6)$