2/7/2011
Section 12

Announcements:

- ☐ Please turn HW to front of room (not in folder!)
- ☐ Exam 1 $\underbrace{\S 1.3 - 1.10}_{1/3 \text{ of test}}$; $\underbrace{2.1 - 2.4, \text{ part of } 2.5}_{2/3 \text{ of test}}$

Review 2 posted (late! Sorry!)

Ch 1 homework passed back weds.

- ☐ Extra office hours:
  - Tues: 12-2) in office.
  - Weds: 3-5)
- . Think Tank exact hours... posted/linked on my website

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§2.4 continued

Example 1: Given $f(x) = \frac{1}{x}$, find a formula for indicated trans of f(x).

(a) Flip over y-axis and shift ↑ 2 units.

$\underbrace{\text{Flip over y-axis}}_{\text{inside}}$ and $\underbrace{\text{shift ↑ 2 units}}_{\text{outside}}$

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

(b) V. stretch by 2 and shift up 3 units

$\underbrace{\text{V. stretch by 2}}_{\text{outside}}$ and $\underbrace{\text{Shift up 3 units}}_{\text{outside}}$

$$y = 2\left(\frac{1}{x}\right) + 3$$

(c) Shift up 3 units and V. stretch by 2.

outside

$$y = 2\left(\left(\frac{1}{x}\right) + 3\right)$$

(d) Shift L by 1 and horiz exp by 2.

inside — ② add 1 to formula inside

inside — ① divide by 2 (mult by ½) on the inside.

$$y = \frac{1}{\frac{1}{2}x + 1}$$

(e) horiz exp by 2 and shift L by 1

Inside — ② divide by 2 (mult ½)

① Inside, add 1 on inside.

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

Example 2: Given $f(x)$ as below, find formulas for the functions as transformations of $f(x)$

x	0	2	4	6
$f(x)$	3	6	9	12

base

(a)

x	0	2	4	6
$g(x)$	1	2	3	4

← same as base

← divide y vals by 3. (mult by ⅓) (outside)

$$\Rightarrow g(x) = \frac{1}{3} f(x)$$

(b)

x	-1	-3	-5	-7
$g(x)$	0	3	6	9

→ reflect across y-axis (mult -1) ② trans

→ shift R by 1 ① trans (subtract by 1.)

→ shift ↓ by 3.

$\Rightarrow g(x) = f(-x-1)-3$

(c)

x	-1	-3	-5	-7
$h(x)$	-6	-12	-18	-24

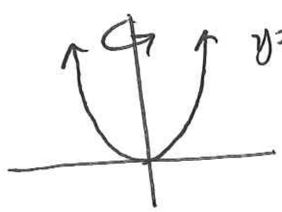
x row $\leftarrow$ ① Reflect (-1 on inside) ②
② Shift L ($+1$ on inside) ①
form

$h(x)$ row $\leftarrow$ Reflect
~~mult~~ V stretch 2.

$h(x) = -2f\big(-(x+1)\big)$

Next topic: Sym about y-axis or origin:

Ex:



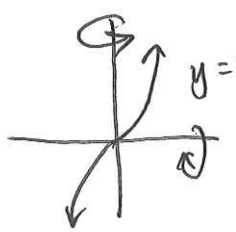
$y=x^2$

this graph is the same even after reflecting over y-axis.
this is called symmetry over y-axis.

In general, if a graph $y=f(x)$ is unchanged after reflecting over y-axis, we say it's sym about the y axis.

$f(-x) = f(x) \leftarrow$ this property is called even.

Ex:



$y=x^3$

this graph is same after reflecting over BOTH the x-and y axes.

In general, if a graph $y = f(x)$ is unchanged after reflectire over both x- and y- axes, then we say graph is symmetric about the origin.

$$-f(-x) = f(x)$$

$\Rightarrow f(-x) = -f(x)$ this property is Called odd.

<u>How can I check for symmetry given a formula?</u>

Sym about y-axis = even : $f(-x) = f(x)$

sym about origin = odd : $f(-x) = -f(x)$

<u>Idea:</u> Evaluate & simplify $f(-x)$.

<u>Example:</u> Determine any symmetries about origin or y-axis

ⓐ $y = \frac{|x|}{x}$ <u>Test:</u> $\frac{|-x|}{-x} = \frac{|x|}{-x} = -\left(\frac{|x|}{x}\right)$ ← odd

$\Rightarrow$ sym about origin.

ⓑ $y = x^4(x^2+x^4)$

test: $(-x)^4((-x)^2+(-x)^4) = x^4(x^2+x^4)$ ✓ even

$\Rightarrow$ sym about y-axis.

ⓒ $y = (x-1)^2$; test: $(-x-1)^2 = (x+1)^2$ neither!

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

§2.5 Quadratics.

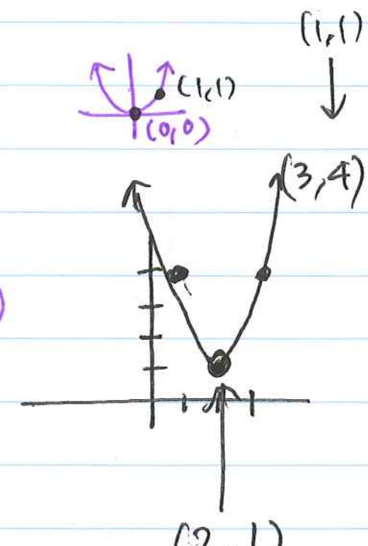
Standard form: $y = a(x-h)^2 + k$

Example 1: Determine where $(0,0)$ on $f(x) = x^2$ goes under the given transformation. Sketch the graph.

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

① V stretch by 3 R 2 ② Shift up 1

$(0,0) \downarrow (2,1)$



$$\boxed{\begin{array}{l} y = a(x-h)^2 + k \\ \text{vertex: } (h, k) \\ a > 0: \vee \qquad a < 0: \wedge \end{array}}$$