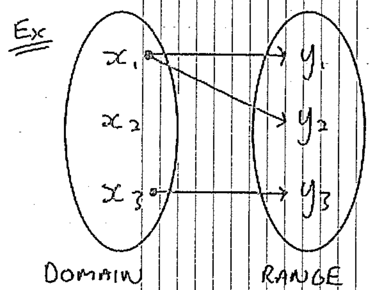
PC 12

Note Title 6/28/2012

1.1 Functions and Relations

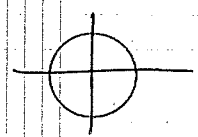
Relation - a rule/equation that produces one or more output (y-values) numbers for every valid input (x-values) numbers.

Ex

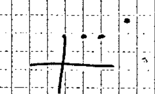


Ex. $\{(3,4), (3,2), (5,1)\}$

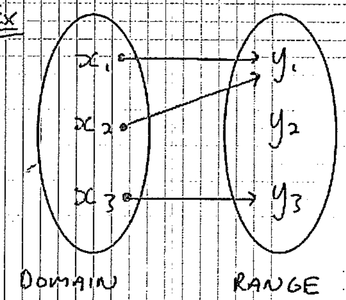
Ex



Function - for every input (x-value) number, there is only one output (y-value) number.

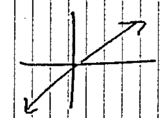


Ex



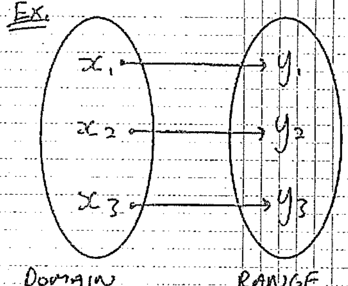
Ex. $\{(1,3), (2,3), (5,7)\}$

Ex.

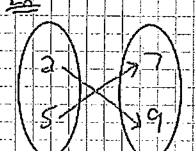


One-to-One Function - a function in which every x-value is associated with one y-value and vice versa.

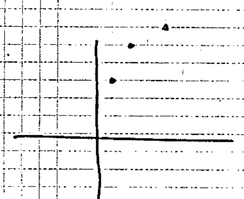
Ex.

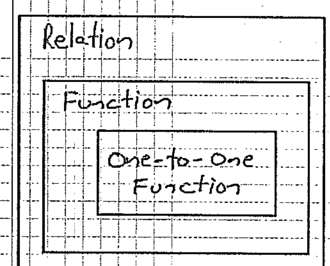


Ex

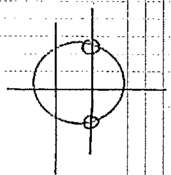


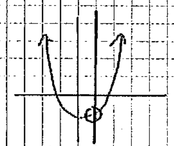
Ex. $\{(1,3), (2,5), (4,6)\}$



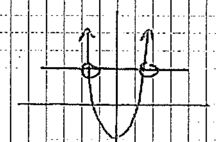


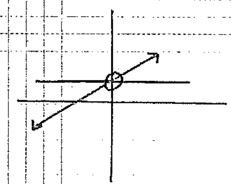
Vertical Line Test - used to determine whether or not a graph is a function.

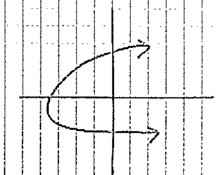




Horizontal Line Test - used to determine whether or not a function is a one-to-one function.



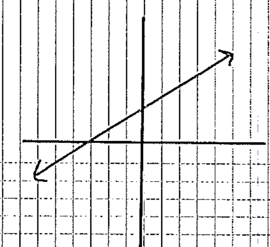




DOMAIN - the domain of a function is the set of all possible x-values (independent values)

RANGE - the range of a function is the set of all possible y-values (dependent values)

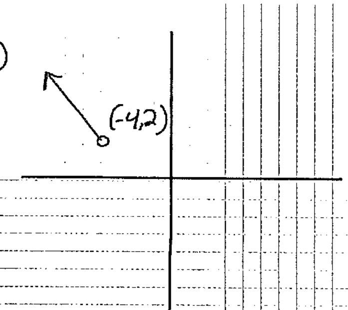
(1)



D: $x \in \mathbb{R}$ or $(-\infty, \infty)$

R: $y \in \mathbb{R}$ or $(-\infty, \infty)$

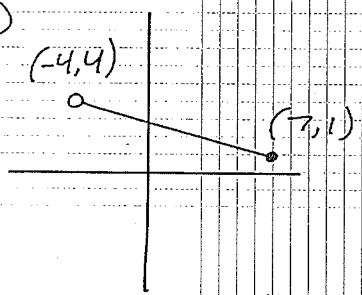
(2)



D: $x < -4$ or $(-\infty, -4)$

R: $y > 2$ or $(2, \infty)$

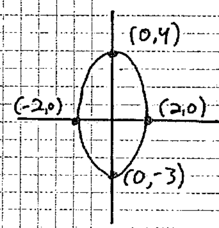
(3)



D: $-4 < x \leq 7$ OR $(-4,7]$

R: $1 \leq y < 4$ OR $[1,4)$

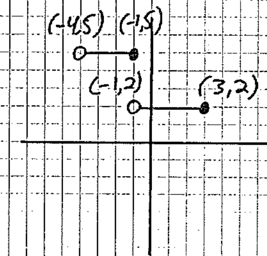
(4)



D: $-2 \leq x \leq 2$ OR $[-2,2]$

R: $-3 \leq y \leq 4$ OR $[-3,4]$

(5)



D: $-4 < x \leq 3$ OR $(-4,3]$

R: $\{2,5\}$

Pg 9
\# 2,3

ANSWER CORRECTIONS:

2g) Neither

i) Function

3f) $0 \leq y \leq 1$

Note Title

1.2 Arithmetic Combinations of Functions

6/26/2012

SUM $(f+g)(x) = f(x) + g(x)$

DIFFERENCE $(f-g)(x) = f(x) - g(x)$

PRODUCT $(fg)(x) = f(x) \cdot g(x)$

QUOTIENT $\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, \; g(x) \neq 0$

① Given $f(x) = 3x+2$, $g(x) = x^2-4x+3$, $h(x) = x^3$, $i(x) = 3$

determine:

a) $(f+g)(x)$

$$f(x)+g(x) = 3x+2+x^2-4x+3$$
$$= \boxed{x^2-x+5}$$

b) $(i-g)(x)$

$$i(x)-g(x) = 3-(x^2-4x+3)$$
$$= 3-x^2+4x-3$$
$$= \boxed{-x^2+4x}$$

$f(x) = 3x+2$, $g(x) = x^2-4x+3$, $h(x) = x^3$, $i(x) = 3$

c) $[h\cdot(f+g)](x)$

$$h(x)[f(x)+g(x)]$$
$$= x^3[x^2-x+5]$$
$$= \boxed{x^5-x^4+5x^3}$$

$f(x) = 3x+2$, $g(x) = x^2-4x+3$, $h(x) = x^3$, $i(x) = 3$

d) $\left(\frac{ig}{h}\right)(2)$

$$\frac{i(2)g(2)}{h(2)} = \frac{(3)(-1)}{8} = \frac{-3}{8}$$

$f(x) = 3x+2,\ g(x) = x^2-4x+3,\ h(x) = x^3,\ i(x) = 3$

e) $(fi)(2) - (hg)(-1)$

$f(2)i(2) - h(-1)g(-1)$

$(8)(3) - (-1)(8)$

$24 - (-8)$

32

$f(x) = 3x+2,\ g(x) = x^2-4x+3,\ h(x) = x^3,\ i(x) = 3$

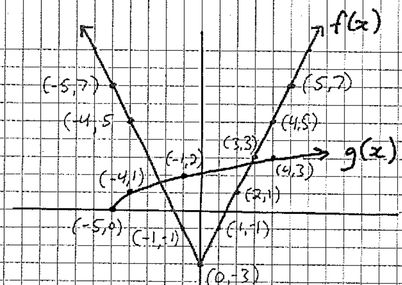
② Use the graphs of $f(x)$ and $g(x)$ to evaluate each function:

Ex

$f(2)+g(4)$

$1 + 3$

$\boxed{4}$



a) $(f+g)(4)$ b) $(f+g)(-5)$ c) $(fg)(-4)$

a) $(f+g)(4)$

$f(4)+g(4)$

$5 + 3$

$\boxed{8}$

b) $(f+g)(-5)$

$f(-5)+g(-5)$

$7 + 0$

$\boxed{7}$

c) $(fg)(-4)$

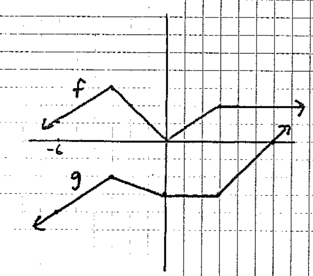
$f(-4)g(-4)$

$(5)(1)$

$\boxed{5}$

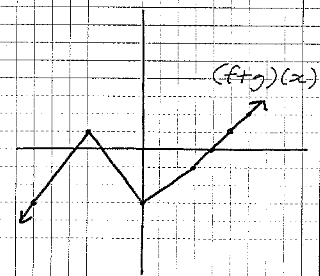
③ Pg 15 #5 (a,e)

a) (a) $(f+g)(x)$

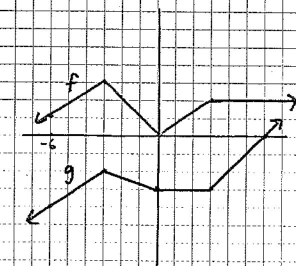


$f(x)+g(x)$

x	y
-6	-3
-3	1
0	-3
3	-1
4	0
5	1
6	2

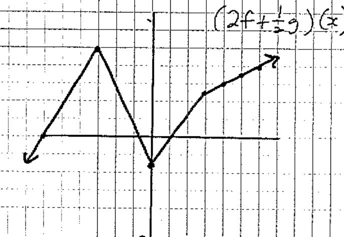


b) (e) $\left(2f+\frac{1}{2}g\right)(x)$



$2f(x)+\frac{1}{2}g(x) \rightarrow 2(1)+\frac{1}{2}(-4)$

x	y
-6	0
-3	5
0	-1.5
3	2.5
4	3
5	3.5
6	4



Pg 13

#1-3 (a,c,e,g)

4-6 (a,c)

7,8 (d,e)

Note Title

1.3 Composite Functions

6/26/2012

The composition of $f(x)$ and $g(x)$ is defined as $f(g(x))$ and is formed when the equation of $g(x)$ is substituted into the equation of $f(x)$.

$$f(g(x)) = (f \circ g)(x)$$

$$g(f(x)) = (g \circ f)(x)$$

① If $f(x) = 2 - x^2$ and $g(x) = 3x + 2$, find

a) $(f \circ g)(x)$

$$\begin{aligned} f(g(x)) &= 2 - (3x+2)^2 \\ &= 2 - (3x+2)(3x+2) \\ &= 2 - (9x^2 + 12x + 4) \\ &= \boxed{-9x^2 - 12x - 2} \end{aligned}$$

b) $(g \circ f)(x)$ $\quad f(x) = 2 - x^2$ and $g(x) = 3x + 2$

$$\begin{aligned} g(f(x)) &= 3(2 - x^2) + 2 \\ &= 6 - 3x^2 + 2 \\ &= \boxed{-3x^2 + 8} \end{aligned}$$

c) $(g \circ g)(x)$ $\quad f(x) = 2 - x^2 \quad g(x) = 3x + 2$

$$\begin{aligned} g(g(x)) &= 3(3x+2) + 2 \\ &= 9x + 6 + 2 \\ &= \boxed{9x + 8} \end{aligned}$$

(2) If $f(x) = 3x+4$ and $g(x) = x^2-1$, determine:

a) $f(g(1))$

$= f(1^2-1)$

$= f(0)$

$= 3(0)+4$

$= \underline{\underline{4}}$

b) $(f \circ g)(-2)$

$= f(g(-2))$

$= f((-2)^2-1)$

$= f(3)$

$= 3(3)+4$

$= \underline{\underline{13}}$

c) $(g \circ f)(-3)$

$= g(f(-3))$

$= g(3(-3)+4)$

$= g(-5)$

$= (-5)^2-1$

$= \underline{\underline{24}}$

(3) Given $f(x) = x-1$, $g(x) = 4$, $h(x) = \frac{x+1}{x-1}$ evaluate

$(h \circ g \circ f)(-2)$

$= (h(g(f(-2))))$

$= (h(g(-3)))$

$= (h(4))$

$= \underline{\underline{\frac{5}{3}}}$

(4) If $f(x) = \frac{x}{x-1}$ and $g(x) = \frac{1}{x+1}$ find:

a) $(f \circ g)(x)$ and its domain

$$f(g(x)) = f\left(\frac{1}{x+1}\right) = \frac{\frac{1}{x+1}}{\frac{1}{x+1} - 1}$$

$$= \frac{\frac{1}{x+1}}{\frac{1}{x+1} - \frac{x+1}{x+1}} = \frac{\frac{1}{x+1}}{\frac{-x}{x+1}} \qquad \frac{1}{\cancel{x+1}} \cdot \frac{\cancel{x+1}}{-x} = \boxed{\frac{1}{-x} \text{ OR } -\frac{1}{x}}$$

$\underline{\underline{D: x \neq 0, \pm 1}}$

b) $(g \circ f)(x)$ $\quad f(x) = \frac{x}{x-1}$ and $g(x) = \frac{1}{x+1}$

$g(f(x)) = g\left(\frac{x}{x-1}\right)$

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

$2x-1 \neq 0$

$2x \neq 1$

$x \neq \frac{1}{2}$

$\underline{\underline{D: x \neq \frac{1}{2}, \pm 1}}$

(5) If $f = \{(2,3), (3,5), (4,-1), (5,0)\}$ determine:

$g = \{(3,7), (4,5), (5,3), (6,1)\}$

a) $f \circ g$

$g(3) = 7 \rightarrow f(7) = \varnothing$

$g(4) = 5 \rightarrow f(5) = 0 \therefore \boxed{(4,0)}$

$g(5) = 3 \rightarrow f(3) = 5 \therefore \boxed{(5,5)}$

$g(6) = 1 \rightarrow f(1) = \varnothing$

$\therefore f \circ g = \{(4,0), (5,5)\}$

b) $g \circ f$

$f(2) = 3 \rightarrow g(3) = 7 \quad (2,7)$

$f(3) = 5 \rightarrow g(5) = 3 \quad (3,3)$

$\therefore g \circ f = \{(2,7), (3,3)\}$

(6) Find two functions $f(x)$ and $g(x)$ such that $h(x) = (f \circ g)(x)$.

a) $h(x) = \dfrac{2}{x^2+4}$

$f(x) = \dfrac{2}{x}$

$g(x) = x^2 + 4$

b) $h(x) = \sqrt[3]{3x^2 - 2}$

$f(x) = \sqrt[3]{x}$

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

$f(x) = \sqrt[3]{x-2}$

$g(x) = 3x^2$

(6) Given $f(x) = x^2 + 2$ and $g(x) = \sqrt{x-2}$ sketch $(f \circ g)(x)$ and state the domain (pg 246 b)

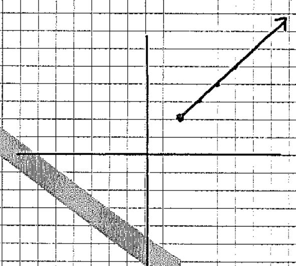
$f(g(x)) = f(\sqrt{x-2})$

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

$= x - 2 + 2$

$= \underline{\underline{x}}$

$\underline{\underline{D: x \geq 2}}$



(6) Determine

a) $k(h(2))$

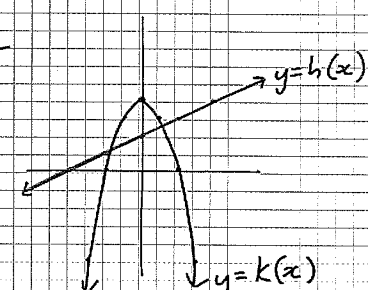
pg 25 #7 a)

b) $h(k(-1))$

pg 25 #7 b)

$k(3) = -5$

$h(3) = 3.5$



Pg 22

#2-5 (a,c,e)

6,7 (a,c,e...)

8-10 (a,c,e)

1.4 TRANSFORMATIONS OF GRAPHS Pt. 1

TRANSLATIONS

Given $y=f(x)$

$y-k=f(x)$ OR $y=f(x)+k$ describes a VERTICAL TRANSLATION

Ex $y=x^2+4$

$y=f(x-h)$ describes a HORIZONTAL TRANSLATION

Ex $y=(x-2)^2$

$$y=f(x-h)+k$$

If $k>0$ Moves graph up
Ex. $y=|x|+2 \rightarrow$ Up 2

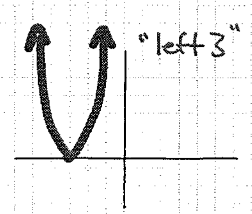
If $k<0$ Moves graph down
Ex. $y=\sqrt{x}-3 \rightarrow$ Down 3

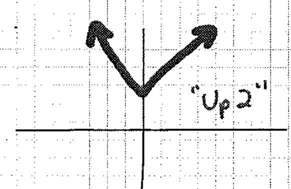
If $h>0$ Moves graph right
Ex. $y=(x-2)^2 \rightarrow$ Right 2

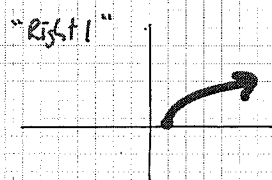
If $h<0$ Moves graph left
Ex $y=\sqrt{x+4} \rightarrow$ Left 4
$y=\sqrt{x-(-4)}$

① Sketch the following functions

a) $y=(x+3)^2$ b) $y=|x|+2$ c) $y=\sqrt{x-1}$







② If $(-5,3)$ or (a,b) are on the graph of $y=f(x)$, what must be on the graph of:

a) $y=f(x+3)$

$(x,y)\rightarrow(x-3,y)$

$\boxed{(-8,3),\ (a-3,b)}$

b) $y=f(x-2)-5$

$(x,y)\rightarrow(x+2,y-5)$

$\boxed{(-3,-2),\ (a+2,b-5)}$

③ If $(2,-4)$ or (a,b) are on the graph of $y=f(x-2)$ what must be on the graph of:

a) $y=f(x)$

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

$\boxed{(0,-4),\ (a-2,\ b)}$

$\boxed{(-1,-6),\ (a-3,\ b-2)}$

④ If $(-3,2)$ or (a,b) are on the graph of $y=f(x+1)-4$ what must be on the graph of $y=f(x+2)+6$

$y=f(x)$?

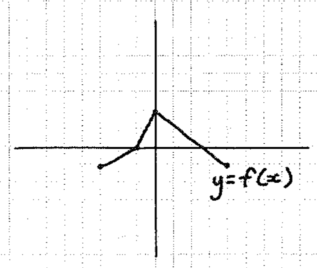
"Move Right 1 and Up 4 to get to start"

$(-2,6)$ / $(a+1,\ b+4)$

↳ $(x-2,\ y+6) \rightarrow \boxed{(-4,\ 12)}$

$\boxed{(a-1,\ b+10)}$

⑤ Given $y=f(x)$ sketch $y=f(x+2)-3$



"Mapping Points"

$(x,y) \rightarrow (x-2,\ y-3)$

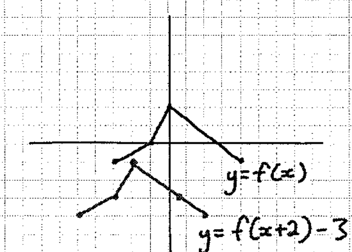
$(-3,-1) \rightarrow (-5,-4)$

$(-1,0) \rightarrow (-3,-3)$

$(0,2) \rightarrow (-2,-1)$

$(2.5,0) \rightarrow (0.5,-3)$

$(4,-1) \rightarrow (2,-4)$



$(-3,-1) \rightarrow (-5,-4)$

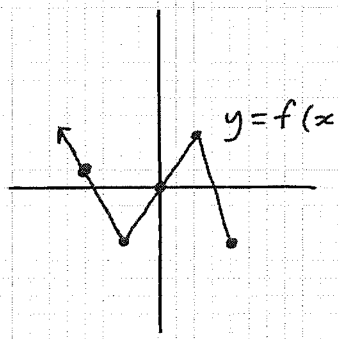
$(-1,0) \rightarrow (-3,-3)$

$(0,2) \rightarrow (-2,-1)$

$(2.5,0) \rightarrow (0.5,-3)$

$(4,-1) \rightarrow (2,-4)$

⑥ Given $y = f(x)$, sketch $y = f(x-3)+2$



$y = f(x)$

$(x, y) \rightarrow (x+3, y+2)$

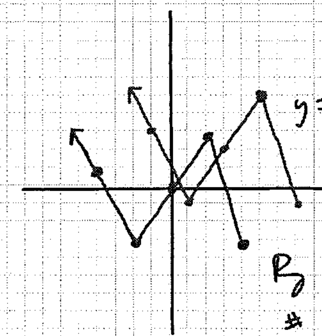
$(-4, 1) \rightarrow (-1, 3)$

$(-2, -3) \rightarrow (1, -1)$

$(0, 0) \rightarrow (3, 2)$

$(2, 3) \rightarrow (5, 5)$

$(4, -3) \rightarrow (7, -1)$



$y = f(x-3)+2$

$(x, y) \rightarrow (x+3, y+2)$

$(-4, 1) \rightarrow (-1, 3)$

$(-2, -3) \rightarrow (1, -1)$

$(0, 0) \rightarrow (3, 2)$

$(2, 3) \rightarrow (5, 5)$

$(4, -3) \rightarrow (7, -1)$

P 34

\# 1 (a, c, e)

2 (a, b, c)

9 (d, e)

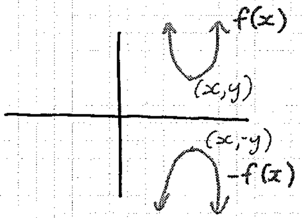
10 (a, d, e)

Note Title 2012-08-28

1.4 Transformations Pt. 2

REFLECTIONS

Reflection in/across the x-axis



$f(x) \rightarrow -f(x)$

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

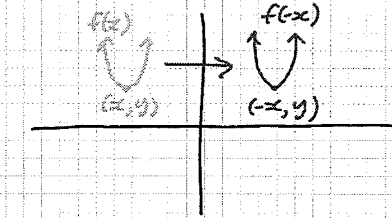
MAPPING OF POINTS

$(x, y) \rightarrow (x, -y)$

Reflection in/across the y-axis

$f(x) \rightarrow f(-x)$

$(x, y) \rightarrow (-x, y)$



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

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

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

COMPRESSIONS AND EXPANSIONS

Given $y = af(bx)$

a affects the y-coordinate (Vertical)

b affects the x-coordinate (Horizontal)

$$y = a f(b(x - h)) + k$$

$a > 1$	Vertical Expansion	$y = 2f(x)$ vert exp. $\times 2$ $(x,y) \rightarrow (x, 2y)$
$0 < a < 1$	Vertical Compression	$y = \frac{1}{2}f(x)$ vert. compr. $\times \frac{1}{2}$ $(x,y) \rightarrow (x, \frac{1}{2}y)$
$a < 0$	Reflection in x-axis	$y = -f(x)$ $(x,y) \rightarrow (x,-y)$
$b > 1$	Horizontal Compression	$y = f(3x)$ horiz. compr $\times \frac{1}{3}$ $(x,y) \rightarrow (\frac{1}{3}x, y)$
$0 < b < 1$	Horizontal Expansion	$y = f(\frac{1}{4}x)$ horiz. exp $\times 4$ $(x,y) \rightarrow (4x, y)$
$b < 0$	Reflection in y-axis	$y = f(-x)$ $(x,y) \rightarrow (-x, y)$

1. Map the point and write the equation of the image of $y = f(x)$ after each transformation.

a) A horizontal expansion by a factor of 5 and a reflection in the y-axis.

$(x, y) \rightarrow (-5x, y)$ $\quad y = f(-\frac{1}{5}x)$

b) A vertical compression by a factor of $\frac{2}{3}$ and a horizontal compression by a factor of $\frac{4}{7}$

$(x, y) \rightarrow (\frac{4}{7}x, \frac{2}{3}y)$ $\quad y = \frac{2}{3}f(\frac{7}{4}x)$

b) $f(x) = |x|$, moved 5 units to the right, horizontally compressed $\times \frac{1}{3}$, and reflected across the x-axis.

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

$\downarrow$

$\boxed{y = -|3(x-5)|} \rightarrow y = -|3x-15|$

$(x, y) \rightarrow (\frac{1}{3}x+5, -y)$

2. Write the equation for each function: $y = a f(b(x-h)) + k$

a) $f(x) = x^2$, moved 4 units to the left, vertically expanded $\times 2$, and 3 units down.

$y = 2f(x+4) - 3$

$\downarrow$

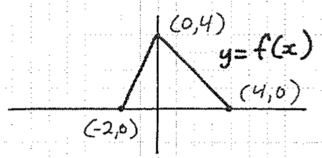
$\boxed{y = 2(x+4)^2 - 3}$ $\quad (x, y) \rightarrow (x-4, 2y-3)$

c) $f(x) = \sqrt{x}$, moved 2 units left and 3 units up, horizontally expanded by 6, vertically compressed by $\frac{1}{4}$, and reflected in the y-axis.

$\boxed{y = \frac{1}{4}\sqrt{-\frac{1}{6}(x+2)} + 3}$

$(x, y) \rightarrow (-6x-2, \frac{1}{4}y+3)$

③ Given $y = f(x)$, sketch the following:



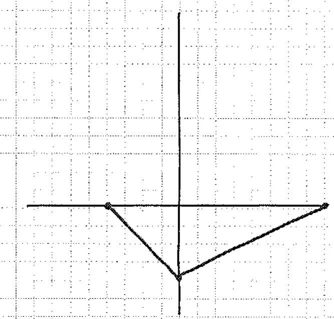
a) $y = -f(\frac{1}{2}x)$ b) $y = 2f(-2x)$ c) $y = -\frac{1}{2}f(x+1)+3$

$(x,y) \to (2x, -y)$ $(x,y) \to (-\frac{1}{2}x, 2y)$ $(x,y) \to (x-1, -\frac{1}{2}y+3)$

a) $y = -f(\frac{1}{2}x)$ → Reflected in x-axis, Horiz. Exp × 2

$(x,y) \to (2x, -y)$

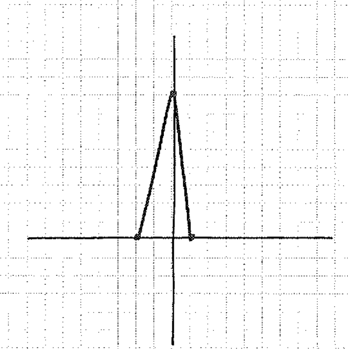
$(-2,0) \to (-4,0)$
$(0,4) \to (0,-4)$
$(4,0) \to (8,0)$



b) $y = 2f(-2x)$ → Vert. Expanded × 2, Horiz Compr. × $\frac{1}{2}$, Reflected in y-axis

$(x,y) \to (-\frac{1}{2}x, 2y)$

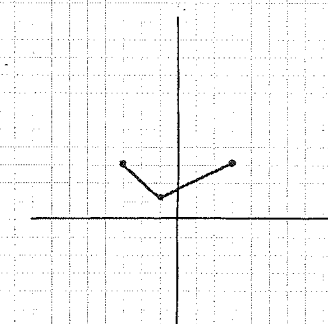
$(-2,0) \to (1,0)$
$(0,4) \to (0,8)$
$(4,0) \to (-2,0)$



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

$(x,y) \to (x-1, -\frac{1}{2}y+3)$

$(-2,0) \to (-3,3)$
$(0,4) \to (-1,1)$
$(4,0) \to (3,3)$



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1, 2 (d, f, h)
11, 12

Note Title 6/27/2012

1.5 Inverse Functions

To determine the inverse $f^{-1}(x)$ of a function $f(x)$:

1. Interchange x and y
2. Solve for y

- Mapping of Points for $f^{-1}(x)$: $(x, y) \rightarrow (y, x)$
- The graphs of $f(x)$ and $f^{-1}(x)$ are symmetric about the line $y = x$

① Determine $f^{-1}(x)$

a) $f(x) = 3x - 2$

$$y = 3x - 2$$

$$x = 3y - 2$$

$$x + 2 = 3y$$

$$\frac{x+2}{3} = y$$

$$y = \frac{x+2}{3}$$

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

b) $f(x) = \dfrac{2x-1}{3x+2}$

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

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

$$3xy + 2x - 2y = -1$$

$$3xy - 2y = -1 - 2x$$

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

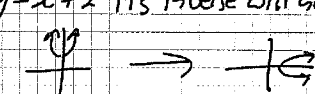
$$\boxed{y = \frac{-1-2x}{3x-2} \quad \text{or} \quad f^{-1}(x) = \frac{-1-2x}{3x-2}}$$

Two functions $f(x)$ and $g(x)$ are inverses of each other if:

$$f[g(x)] = x \quad \text{and} \quad g[f(x)] = x$$

* Note: If $f(x)$ is not one-to-one, its inverse will not be a function

Ex Given $y = x^2 + 2$ its inverse will not be a function



(2) Determine whether the following are inverses of each other.

a) $f(x) = x^3 - 2$, $g(x) = \sqrt[3]{x+2}$

$f[g(x)] =$

$= \left(\sqrt[3]{x+2}\right)^3 - 2$

$= x + 2 - 2$

$= x$ ✓

$g[f(x)] =$

$= \sqrt[3]{x^3 - 2 + 2}$

$= \sqrt[3]{x^3}$

$= x$ ✓

Yes they are inverses of each other

b) $f(x) = \sqrt[4]{x}$, $g(x) = x^4$

$f[g(x)] = f(x^4)$

$= \sqrt[4]{x^4}$

*

$= \pm x$ ✗

$g[f(x)] = g(\sqrt[4]{x})$

$= \left(\sqrt[4]{x}\right)^4$

$= x$ ✓

No, not inverses of each other

(3) If $(-2,3)$ is on the graph of $y = f(x)$, what must be a point on the graph for:

a) $y = f^{-1}(x) + 4$ * swap points first

$(x, y) \rightarrow (y, x) \rightarrow (y, x+4)$

$(-2, 3) \rightarrow (3, -2) \rightarrow (3, 2)$

$\boxed{(3,2)}$

b) $y = -f^{-1}(x-5)$ $(-2,3) \rightarrow ?$

$(x, y) \rightarrow (y, x) \rightarrow (y+5, -x)$

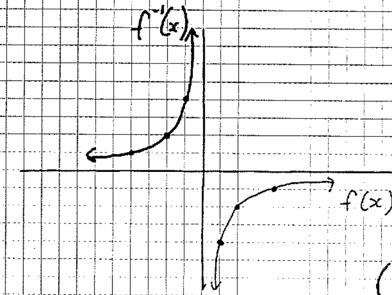
$(-2,3) \rightarrow (3,-2) \rightarrow (3,2) \rightarrow \boxed{(8,2)}$

c) $y = f^{-1}(x+2) - 3$ $\quad (-2,3) \to ?$

$(x,y) \to (y,x) \to (y-2, x-3)$

$(-2,3) \to (3,-2) \to \boxed{(1,-5)}$

(4) Given the graph of $f(x)$ graph its inverse $f^{-1}(x)$



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\#1 (all)

2,3,6,7 (a,c,e)

9,10,11 $\quad$ * #7c) $(0,-1)$

$(1,-4) \to (-4,1)$

$(2,-2) \to (-2,2)$

$(4,-1) \to (-1,4)$

Note Title

1.6 Combined Transformations

6/28/2012

The order in which transformations are performed is important when:

* a translation and a stretch in the same direction are combined.

ie. horizontal translation and horizontal compression

$f(2x+5)$

$f(2(x+\frac{5}{2}))$

Follow this order:

1. FACTOR
2. C - Compression / Expansion
3. R - Reflections
4. T - Translations

Ex. Given: $y=f(3x-3) \Rightarrow y=f(3(x-1))$

C - Horiz. Compr. $\times \frac{1}{3}$

R -

T - Right 1

$(x,y) \rightarrow (\frac{1}{3}x, y) \rightarrow (\frac{1}{3}x+1, y)$

1. Show a mapping of the points for:

a) $y=f(-2x+8)-14$

$y=f(-2(x-4))-14$

C - Horiz. Compr. $\times \frac{1}{2}$

R - y-axis

T - Right 4, Down 14

$(x,y) \rightarrow (\frac{1}{2}x, y)$

$\downarrow$

$(-\frac{1}{2}x, y)$

$\downarrow$

$\boxed{(-\frac{1}{2}x+4, y-14)}$

b) $y=-\frac{1}{6}f(\frac{1}{2}x+2)+5$

$y=-\frac{1}{6}f(\frac{1}{2}(x+4))+5$

C - Vert. Compr. $\times \frac{1}{6}$, Horiz. Exp $\times 2$

R - x-axis

T - Left 4, Up 5

$(x,y) \rightarrow (2x, \frac{1}{6}y) \rightarrow (2x, -\frac{1}{6}y)$

$\downarrow$

$\boxed{(2x-4, -\frac{1}{6}y+5)}$

(2) If the point $(6, -12)$ is on the graph of $y = f(x)$, which point must be on the graph of $y = f\left(-\frac{1}{3}x + 6\right)$?

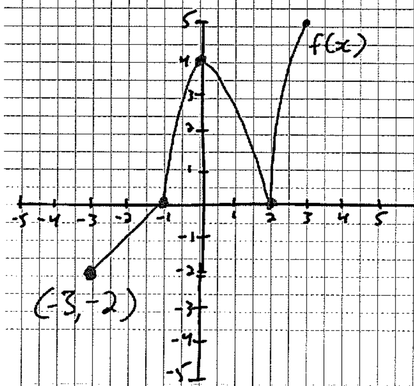
A. $(-36, -12)$
B. $(-24, -12)$
C. $(0, -12)$
D. $(16, -12)$

$y = f\left(-\frac{1}{3}(x - 18)\right)$

$(x, y) \to (-3x + 18, y)$

$\boxed{(0, -12) \quad C}$

(3) Given $y = f(x)$, sketch $y + 4 = -\frac{1}{2}f(x+2)$



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

C - vert. comp. $\times \frac{1}{2}$

R - reflection in x-axis

T - left 2, down 4

$(x, y) \to (x, \frac{1}{2}y) \to (x, -\frac{1}{2}y) \to (x-2, -\frac{1}{2}y - 4)$

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

C - vert. comp. $\times \frac{1}{2}$

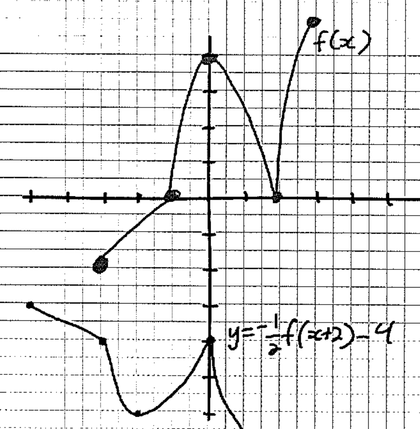
R - reflection in x-axis

T - left 2, down 4

$(x, y) \to (x, \frac{1}{2}y) \to (x, -\frac{1}{2}y) \to (x-2, -\frac{1}{2}y - 4)$

$(x, y) \to (x, \frac{1}{2}y) \to (x, -\frac{1}{2}y) \to (x-2, -\frac{1}{2}y - 4)$

$(-3,-2)$	$(-5,-3)$
$(-1,0)$	$(-3,-4)$
$(0,4)$ →	$(-2,-6)$
$(2,0)$	$(0,-4)$
$(3,5)$	$(1,-6.5)$



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#1-3 (a, c, e...)

7

REVIEW

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#1-65

* NOT #4, 21, 37, 63