

Skill 1 - Operations with Functions

$$f(x) = 3x + 5 \quad g(x) = x^2 - 2x \quad h(x) = \frac{x-5}{3} \quad j(x) = x - 2$$

$$1) (f+g)(x) = f(x) + g(x)$$

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

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

$$2) (j * f)(2) = j(2) * f(2)$$

$$(2-2) * (3(2)+5)$$

$$0 * (6+5)$$

$$0 * 11$$

$$(j * f)(2) = 0$$

$$3) (f * g)(x) = f(x) * g(x)$$

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

$$3x^3 - 6x^2 + 5x^2 - 10x$$

$$4) (g+f)(4) = g(4) + f(4)$$

$$((4)^2 - 2(4)) + (3(4) + 5)$$

$$(16 - 8) + (12 + 5)$$

$$8 + 17$$

$$(f * g)(x) = 3x^3 - x^2 - 10x$$

$$(g+f)(4) = 25$$

Plug $f(x)$ in for x in $g(x)$

Plug $f(x)$ in for x in $h(x)$

$$5) (g \circ f)(x) = g(f(x))$$

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

$$(3x+5)(3x+5) - 2(3x+5)$$

$$9x^2 + 30x + 25 - 6x - 10$$

$$(g \circ f)(x) = 9x^2 + 24x + 15$$

$$6) (h \circ f)(x) = h(f(x))$$

$$\frac{(3x+5)-5}{3} = \frac{3x}{3} = x$$

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

$$7) \left(\frac{f}{j}\right)(2) = \frac{f(2)}{j(2)} = \frac{3(2)+5}{2-2} = \frac{6+5}{0} = \frac{11}{0} \text{ undef.}$$

$$\left(\frac{f}{j}\right)(2) = \text{undef.}$$

$$8) \left(\frac{j}{g}\right)(x) = \frac{j(x)}{g(x)} = \frac{x-2}{x^2-2x} = \frac{x-2}{x(x-2)} = \frac{1}{x}$$

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

Skill 2 * Evaluating Here → Graphing on graph paper!

1) $f(x) = \begin{cases} 2x+3, & x \leq 1 \\ -x+4, & x > 1 \end{cases}$ $x=2 \rightarrow 2 > 1$
 $\rightarrow -x+4 \rightarrow -2+4$
 $f(2) = 2$

2) $g(x) = \begin{cases} x^2-1, & x \leq 2 \\ -x, & x > 2 \end{cases}$ $x=2 \rightarrow 2 \leq 2$
 $\rightarrow x^2-1 \rightarrow (2)^2-1 \rightarrow 4-1$
 $f(2) = 3$

Skill 3 Inverse Functions - Work Here, Graphing on graph paper

* Switch x/y
Solve for y

A

1) $f(x) = \sqrt{3x-5}$

$y = \sqrt{3x-5}$

$(x) = (\sqrt{3y-5})^2$

$x^2 = 3y-5$

$x^2+5 = 3y$

$y = \frac{x^2+5}{3}$

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

$f^{-1}(x)$

x	y
1	2
2	3
4	7

2) $f(x) = 8x+1$

$y = 8x+1$

$x = \frac{y-1}{8}$

$x-1 = 8y$

$y = \frac{x-1}{8}$

$f^{-1}(x) = \frac{x-1}{8}$

$f(x)$

x	y
-1	-7
0	1
1	9

$f^{-1}(x)$

x	y
-7	-1
1	0
9	1

3) $f(x) = x^3-4$

$y = x^3-4$

$x = \sqrt[3]{y+4}$

$x+4 = y^3$

$y = \sqrt[3]{x+4}$

$f^{-1}(x) = \sqrt[3]{x+4}$

$f^{-1}(x)$

x	y
-2	-12
-1	-5
0	-4
1	-3
2	4

$f^{-1}(x)$

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

Skill 3 - Inverse Functions

B. 1) $f(x) = 2x - 5$ $(f \circ g)(x) = x$?

$g(x) = \frac{x+5}{2}$ $2\left(\frac{x+5}{2}\right) - 5$

$x+5-5$

$(f \circ g)(x) = x$ **Yes!**

2) $f(x) = 3x + 1$ $(f \circ g)(x) = x$?

$g(x) = \frac{1}{3}x - 1$ $3\left(\frac{1}{3}x - 1\right) + 1$

$x - 3 + 1$

$x - 2 \neq x$ **No!**

Skill 4 - Identifying Parent Graphs/Equations

Name	Equation
1. Quadratic Function	$y = x^2$
2. x^4 Function	$y = x^4$
3. Cubic Function	$y = x^3$
4. Cube Root Function	$y = \sqrt[3]{x}$ or $y = x^{1/3}$
5. Square Root Function	$y = \sqrt{x}$ or $y = x^{1/2}$
6. Absolute Value Function	$y = x $
7. Reciprocal Function	$y = 1/x$ or $y = x^{-1}$
8. Identity Function	$y = x$
9. Constant Function	$y = c$
10. Vertical Line Graph	$x = c$

* Not Function!

Skill 5 - Transformations of Parent Graphs

* Transformation: Domain/Range Here

Graphs on Graph Paper.

* $2(x-1)^2 - 4$

1) Transformations: Quadratic Function ($y = x^2$)

- Vertical Stretch by 2

- Horizontal Shift Right 1 unit

- Vertical Shift down 4 units

D: $(-\infty, \infty)$ R: $[-4, \infty)$

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

Transformations: Cubic Function ($y = x^3$)

- Reflected over x-axis

- Horizontal Shift left 2 units

D: $(-\infty, \infty)$ R: $(-\infty, \infty)$

3) $y = -|x+3| + 2$

Transformations: Absolute Value Function ($y = |x|$)

- Reflected over x-axis

- Horizontal Shift left 3 units

- Vertical Shift up 2 units

D: $(-\infty, \infty)$ R: $(-\infty, 2]$

4) $y = \frac{1}{2}\sqrt{x} - 1$

Transformations: Square Root Function ($y = \sqrt{x}$)

- Vertical Shrink by $\frac{1}{2}$

- Vertical Shift down 1 unit

D: $[0, \infty)$

R: $[-1, \infty)$

Skill 6 - Domain and Range

1) a) $D: (-\infty, 2) \cup (2, \infty)$
 $R: [0, \infty)$

b) Function? Yes!

c) Inverse a Function? No!

2) a) $D: (-\infty, \infty)$
 $R: (-\infty, \infty)$

b) Function? Yes!

c) Inverse a Function? Yes!

3) a) $D: (-\infty, \infty)$
 $R: [-3, \infty)$

b) Function? Yes!

c) Inverse a Function? No!

4) a) $D: (-\infty, -4) \cup (-4, \infty)$
 $R: (-\infty, 3) \cup (3, \infty)$

b) Function? Yes!

c) Inverse a Function? Yes!

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1) a) $D: (-\infty, 3) \cup (3, \infty)$
 $R: [0, \infty)$

b) Function? Yes!

c) Inverse a Function? No!

2) a) $D: (-\infty, \infty)$

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

b) Function? Yes!

c) Inverse a Function? Yes!

(3) a) $D: (-\infty, \infty)$

$R: [-3, \infty)$

b) Function? Yes!

c) Inverse a Function? No!

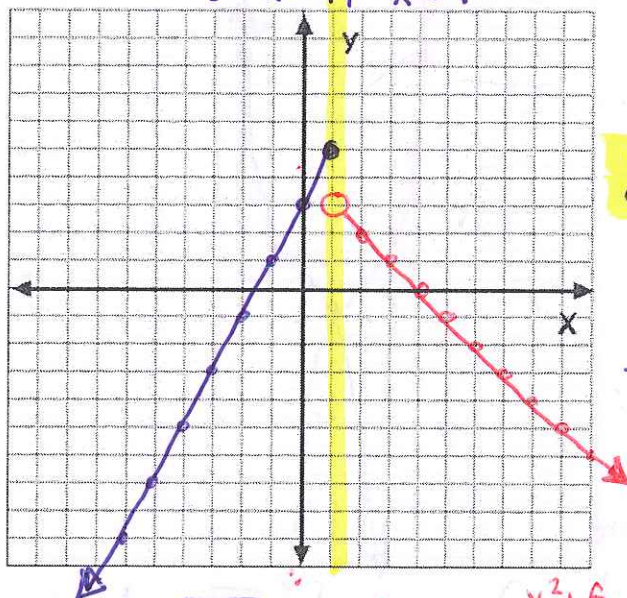
4) a) $D: (-\infty, -4) \cup (-4, \infty)$

$R: (-\infty, 3) \cup (3, \infty)$

b) Function? Yes!

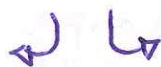
c) Inverse a Function? Yes!

$$f(x) = \begin{cases} 2x+3, & x \leq 1 \\ -x+4, & x > 1 \end{cases}$$

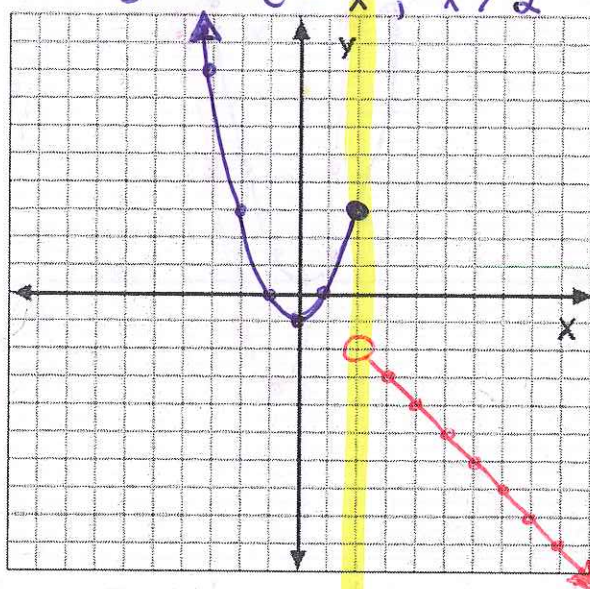


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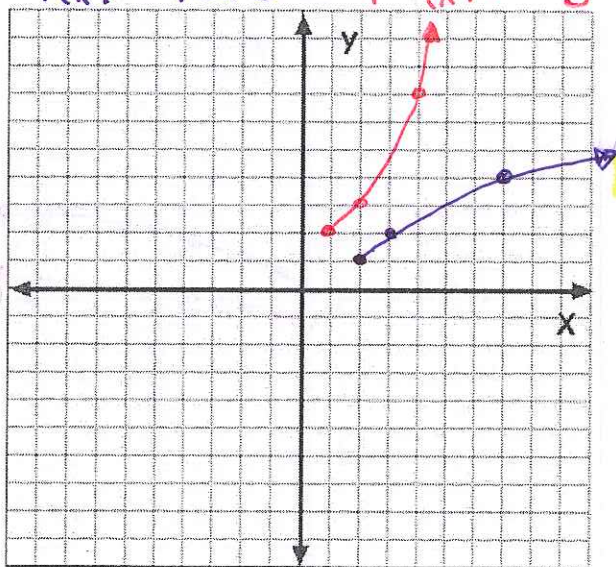
2



$$g(x) = \begin{cases} x^2-1, & x \leq 2 \\ -x, & x > 2 \end{cases}$$



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

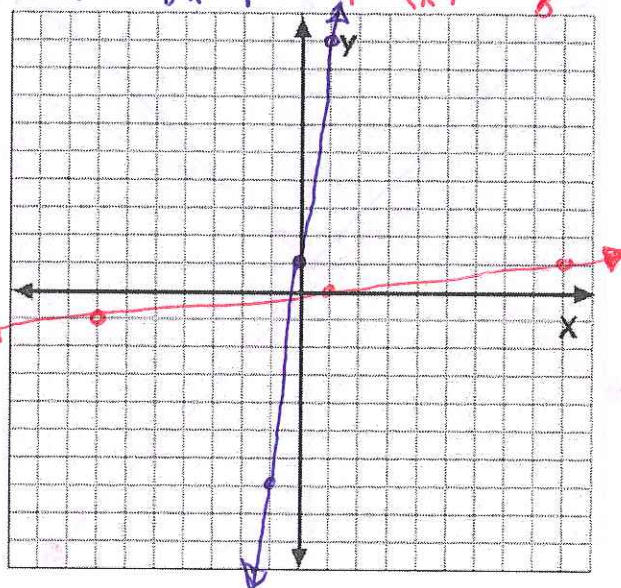


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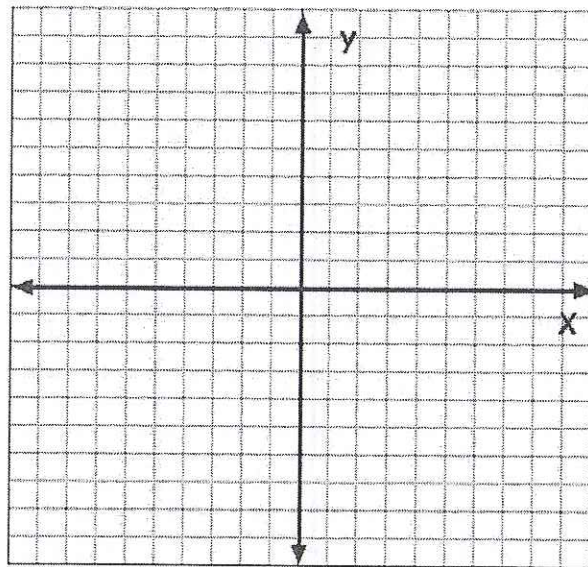
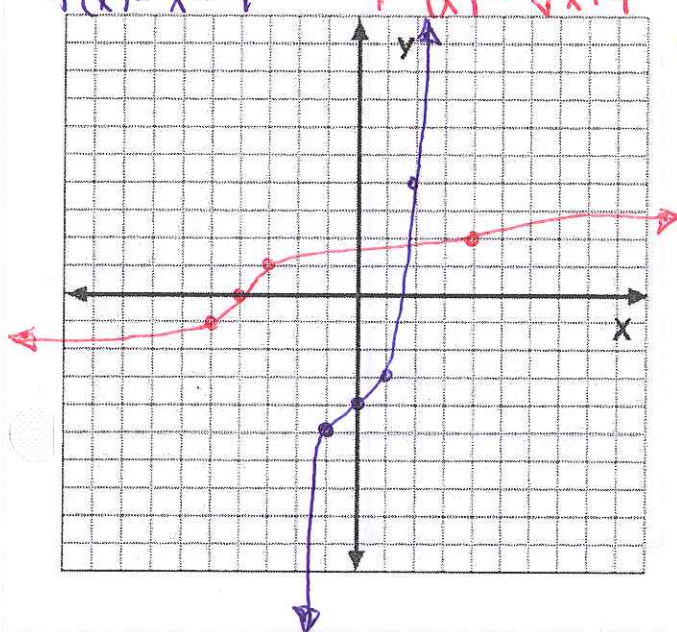
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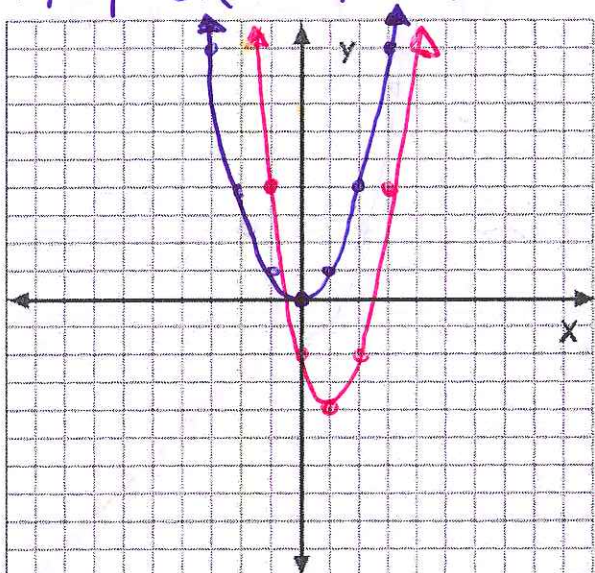
② $f(x) = 8x+1$ $f^{-1}(x) = \frac{x-1}{8}$



③ $f(x) = x^3-4$ $f^{-1}(x) = \sqrt[3]{x+4}$



$$1) y = 2(x-1)^2 - 4$$



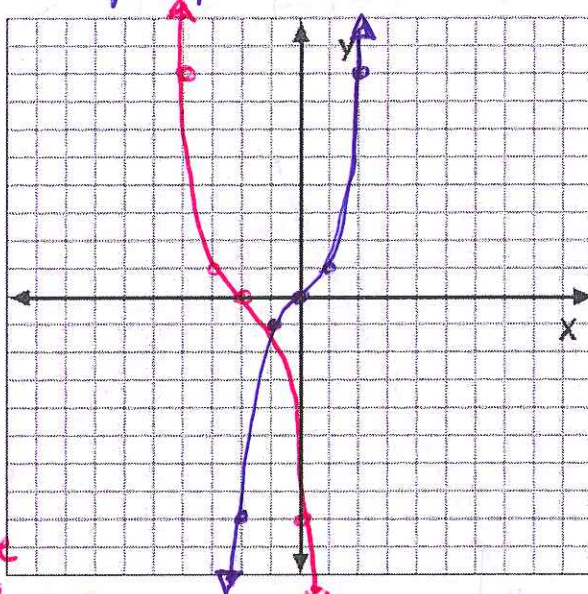
Skill
5

1) Multiply
y-value of
pt. on pg
by "a"

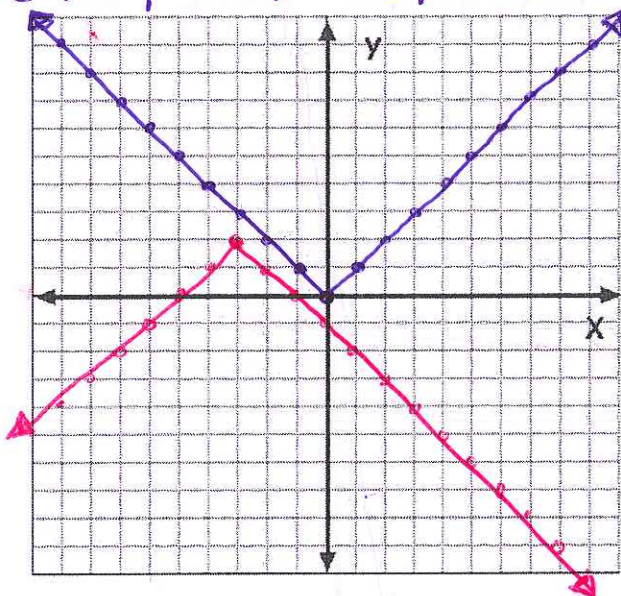
2) Move to
new y-value

3) Do Horiz. /
Vert.
Shifts!

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



$$3) y = -|x+3| + 2$$



$$4) y = \frac{1}{2}\sqrt{x} - 1$$

