QUIZ 9 **MATH 161** **THOMPSON**

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

a. Find $f \circ g(x) = (\sqrt{x-4})^2 + 5 = x + 1$ Domain $\{x \mid x \geq 4\}$

b. Find $g \circ f(x) = \sqrt{x^2+5-4} = \sqrt{x^2+1}$ Domain all reals

c. Find $f \circ f(x) = (x^2+5)^2 + 6 = x^4 + 10x^2 + 31$ Domain all reals

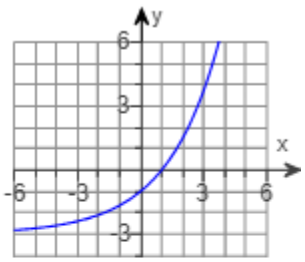
d. Find $g \circ g(x) = \sqrt{\sqrt{x-4}-4}$ Domain $\{x \mid x \geq 20\}$

**Square 4 then add 4 to get 20

*ALWAYS SQUARE THE # THEN ADD IT TO ITSELF

EX :$\sqrt{\sqrt{x-8}-8} \rightarrow$ $8^2 + 8 = 75$ THEN Domain $\{x \mid x \geq 72\}$

2) The graph of a function f is given. Use the horizontal-line test to determine whether f is one-to-one.



Is f one-to-one?

- No
- Yes

3) A function f has an inverse function. If the graph of f^{-1} lies in quadrant I, in which quadrant does the graph of f lie?

- Quadrant I

Quadrant I and III stay the same
Quadrants II and IV switch

4) The function $f(x) = \frac{2x+7}{x+2}$ is one-to-one.

(a) Find its inverse and check your answer.

Find the inverse of $f(x) = \frac{2x+7}{x+2}$

Switch x and y then solve for y. $x = \frac{2y+7}{y+2}$ $x(y+2) = 2y+7$

$$xy + 2x = 2y + 7$$
$$xy - 2y = -2x + 7$$

**factor out the y* $y(x-2) = -2x+7$

$$f^{-1} = \frac{-2x+7}{x-2}$$

Domain of f ***(original)*** *is {x|x≠ -2} Range of f is {y|y≠2}*

Domain and Range of function and its ***inverse*** *are opposite, THEREFORE…*

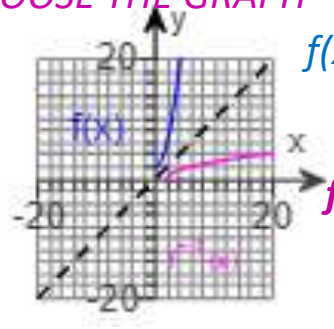
Domain of f^{-1} *is {x|x≠2}* *Range of* f^{-1} *is {y|y≠ -2}*

5) The function $f(x) = x^2 + 2$, $x \geq 0$ is one-to-one.
(a) Find the inverse of f and check the answer.
(b) Find the domain and the range of f and f^{-1}.
(c) Graph f, f^{-1}, and y = x on the same coordinate axes.

X = y^2 + 2
x-2 = y^2
$\sqrt{x-2} = y'$ $f^{-1}(x) = \sqrt{x-2}$

Domain of **f** is $x \geq 0$
Range of **f** is $y \geq 2$
Domain of $\mathbf{f^{-1}}$ is $x \geq 2$
Range of $\mathbf{f^{-1}}$ is $y \geq 0$ **the domain and range switch*

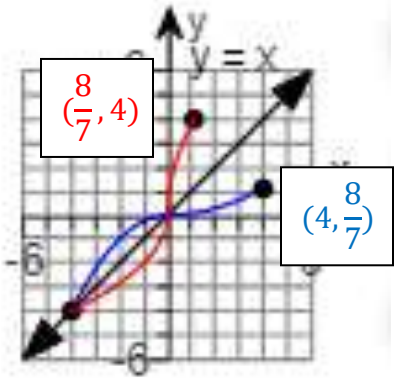
CHOOSE THE GRAPH

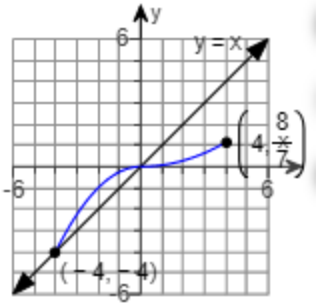


f(x)-blue (up 2)

$f^{-1}(x)$=*pink* (right 2)

6) The graph of a one-to-one function is shown to the right. Draw the graph of the inverse function f^{-1}.





Switch x and y on the point

7) Find functions f and g so that $f \circ g = H$.

$H(x) = |7x + 9|$

g(x) goes into f(x)

- A. $f(x) = |-x|$, $g(x) = \frac{x-9}{7}$
- B. $f(x) = |x|$, $g(x) = 7x + 9$
- C. $f(x) = 7x + 9$, $g(x) = |x|$
- D. $f(x) = \frac{x-9}{7}$, $g(x) = |-x|$

8) The domain of a one-to-one function f is $[4, \infty)$, and its range is $[-2, \infty)$. State the domain and the range of f^{-1}.

Switch domain and range

What is the domain of f^{-1}?

The domain of f^{-1} is $[-2, \infty)$.
(Type your answer in interval notation.)

What is the range of f^{-1}?

The range of f^{-1} is $[4, \infty)$.
(Type your answer in interval notation.)

9) Given $f(x) = 5x$ and $g(x) = 8x^2 + 6$, find the following expressions.

(a) $(f \circ g)(4)$ (b) $(g \circ f)(2)$ (c) $(f \circ f)(1)$ (d) $(g \circ g)(0)$

(a) $(f \circ g)(4) =$ 670 (Simplify your answer.) $g(4)=134 \rightarrow f(134) = 670$

(b) $(g \circ f)(2) =$ 806 (Simplify your answer.) $f(2)=10 \rightarrow g(10) = 806$

(c) $(f \circ f)(1) =$ 25 (Simplify your answer.) $f(1)= 5 \rightarrow f(5) = 25$

(d) $(g \circ g)(0) =$ 294 (Simplify your answer.) $g(0)=6 \rightarrow g(6) = 294$

10) For $f(x) = x^2$ and $g(x) = x^2 + 1$, find the following composite functions and state the domain of each.

(a) $f \circ g$ (b) $g \circ f$ (c) $f \circ f$ (d) $g \circ g$

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

x^4+2x^2+1 x^4+1 x^4 x^4+2x^2+2

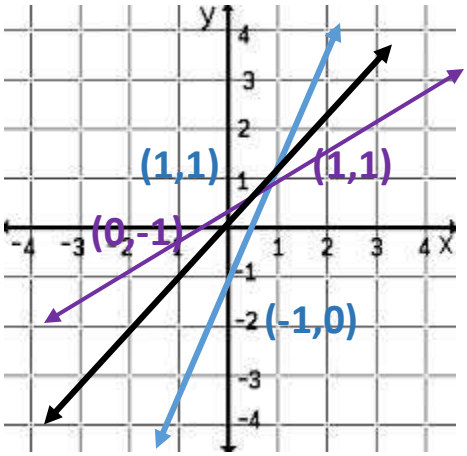
B. The domain of $g \circ f$ is all real numbers. For all parts because they are parabolas

11) The function $f(x) = 2x - 1$ is one-to-one.
(a) Find the inverse of f and check the answer.
(b) Find the domain and the range of f and f^{-1}.
(c) Graph f, f^{-1}, and $y = x$ on the same coordinate axes.

$x = 2y - 1$

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

f(x) = 2x-1



Domain and Range are all reals

Can't plot fractions on the inverse function
find points on the ***original line*** *and switch the coordinates for the* ***inverse line.***

Don't forget to plot the y = x line plot (0,0) and (1,1) to get the line

12) Find the inverse of $f(x) = \frac{8x}{x+3}$

Switch x and y then solve for y. $x = \frac{8y}{y+3}$ $x(y+3) = 8y$

$$xy + 3x = 8y$$
$$xy - 8y = -3x$$

**factor out the y* $y(x-8) = -3x$

$$f^{-1} = \frac{-3x}{x-8}$$

Domain of f is {x|x≠-3} *Range of f is {y|y≠8}*

Domain and Range of function and its inverse are opposite, THEREFORE…

Domain of f^{-1} is {x|x≠8} *Range of f^{-1} is {y|y≠-3}*

13) A function f has an inverse function. If the graph of f^{-1} lies in quadrant IV, in which quadrant does the graph of f lie?

Quadrant II

Quadrant I and III stay the same
Quadrants II and IV switch