

ALEKS® Module C Practice Test #1

College Algebra / Math 121C – GARAGE (Dr. Vasan)

Student Name/ID:

1. Suppose that the functions f and g are defined as follows.

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

$$g(x) = \frac{1}{\sqrt{x-2}}$$

Find $f - g$ and $f \cdot g$. Then, give their domains using interval notation.

$$(f - g)(x) = \quad \square$$

$$\text{Domain of } f - g: \quad \square$$

$$(f \cdot g)(x) = \quad \square$$

$$\text{Domain of } f \cdot g: \quad \square$$

2. Suppose that the functions u and w are defined as follows.

$$u(x) = x^2 + 7$$

$$w(x) = \sqrt{x + 8}$$

Find the following.

$$(u \circ w)(1)$$

$$(w \circ u)(1)$$

3. Suppose $H(x) = \sqrt{4 - 4x}$.

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

Neither function can be the identity function.

(There may be more than one correct answer.)

4. For the real-valued functions $g(x) = \frac{x+6}{x+5}$ and $h(x) = 2x - 7$, find the composition $g \circ h$ and specify its domain using interval notation.

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

Domain of $g \circ h$:

5. Suppose that the functions f and g are defined as follows.

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

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

(a) Find $\left(\frac{f}{g}\right)(-5)$.

(b) Find all values that are NOT in the domain of $\frac{f}{g}$.

If there is more than one value, separate them with commas.

6. The one-to-one function h is defined below.

$$h(x) = \frac{7x}{2x - 1}$$

Find $h^{-1}(x)$, where h^{-1} is the inverse of h .

Also state the domain and range of h^{-1} in interval notation.

7. The one-to-one function f is defined below.

$$f(x) = \sqrt{x + 5} + 4$$

Find f^{-1} , the inverse of f . Then give the domain of f^{-1} using interval notation.

8. For each pair of functions f and g below, find $f(g(x))$ and $g(f(x))$. Then, determine whether f and g are inverses of each other.

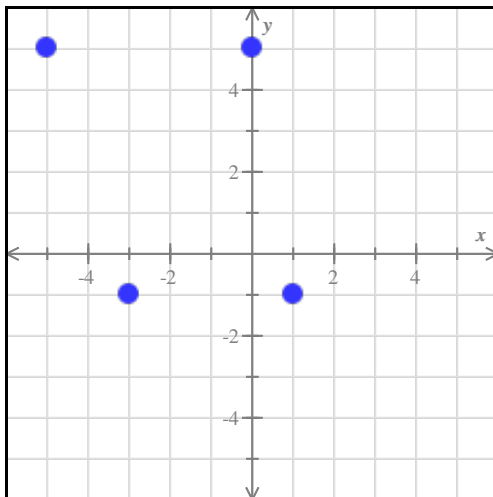
Simplify your answers as much as possible.

(Assume that your expressions are defined for all x in the domain of the composition.)

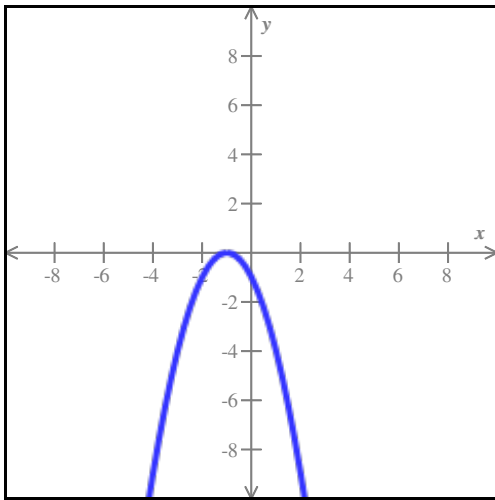
You do *not* have to indicate the domain.)

(a) $f(x) = \frac{6}{x}$	(b) $f(x) = 2x + 3$
$g(x) = \frac{6}{x}$	$g(x) = 2x - 3$
$f(g(x)) =$	$f(g(x)) =$
$g(f(x)) =$	$g(f(x)) =$
- f and g are inverses of each other	- f and g are inverses of each other
- f and g are <i>not</i> inverses of each other	- f and g are <i>not</i> inverses of each other

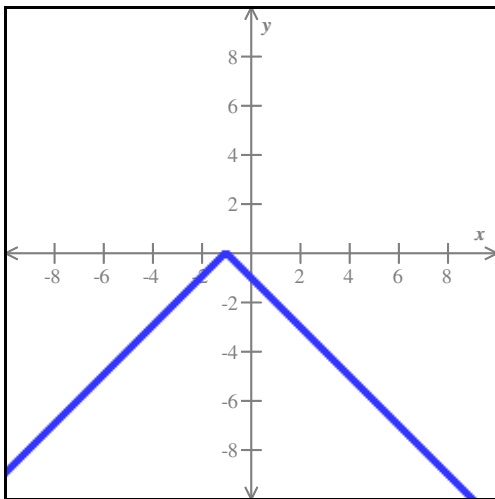
9. For each function graphed below, state whether it is one-to-one.



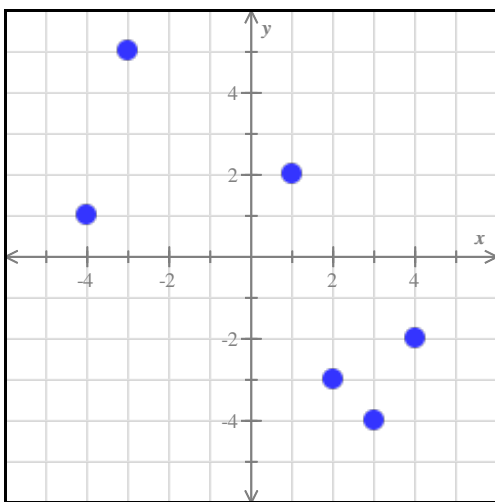
One-to-one?:
Yes No



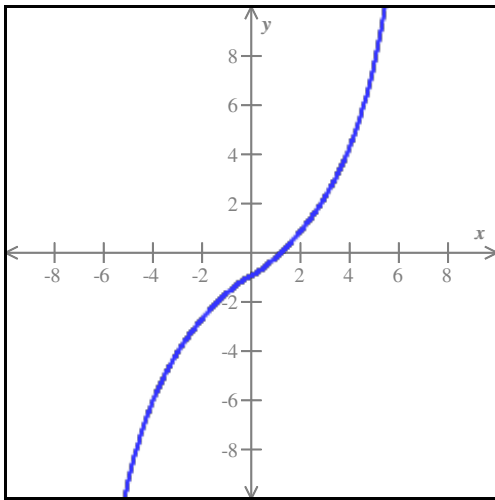
One-to-one?:
Yes No



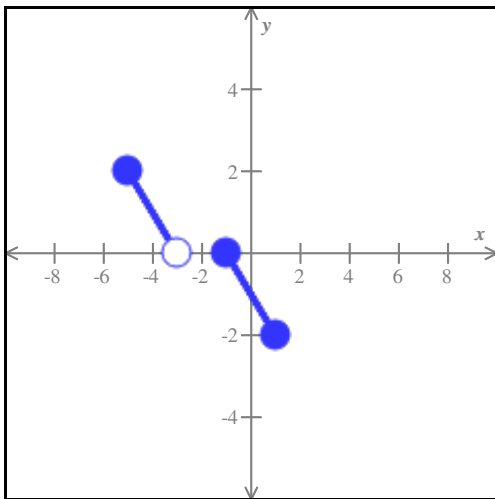
One-to-one?:
Yes No



One-to-one?:
Yes No



One-to-one?:
 Yes No

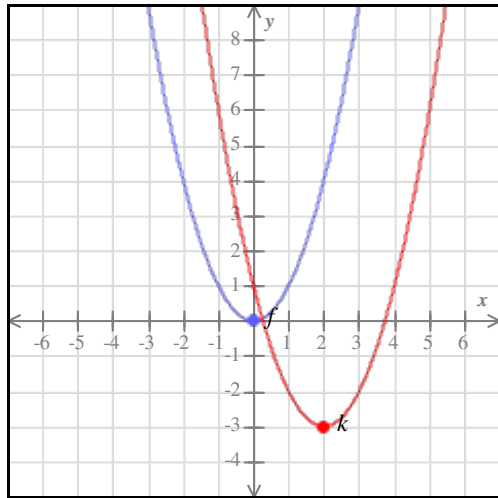


One-to-one?:
 Yes No

10. The graph of f (in blue) is translated a whole number of units horizontally and vertically to obtain the graph of k (in red).

The function f is defined by $f(x) = x^2$.

Write down the expression for $k(x)$.



11. A species of fish was added to a lake. The population size $P(t)$ of this species can be modeled by the following function, where t is the number of years from the time the species was added to the lake.

$$P(t) = \frac{1000}{1 + 7e^{-0.3t}}$$

Find the initial population size of the species and the population size after 8 years.
Round your answers to the nearest whole number as necessary.

Initial population size: fish

Population size after 8 years: fish

12. A certain forest covers an area of 3400 km^2 . Suppose that each year this area decreases by 6%.
What will the area be after 14 years? Round your answer to the nearest square kilometer.

13. If the rate of inflation is 3.9% per year, the future price $p(t)$ (in dollars) of a certain item can be modeled by the following exponential function, where t is the number of years from today.

$$p(t) = 3000(1.039^t)$$

Find the current price of the item and the price 9 years from today.
Round your answers to the nearest dollar as necessary.

14. Rewrite as an exponential equation.

$$\log_3 \frac{1}{81} = -4$$

$$\square^{\square} = \square$$

15. Evaluate.

$$\log_3 27$$

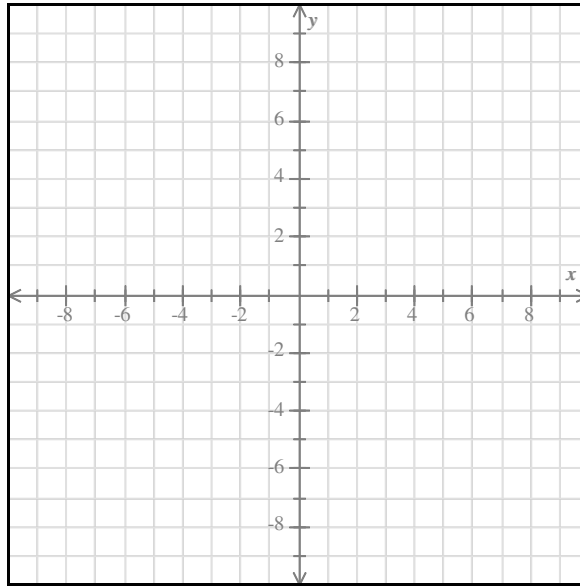
16. Solve for x .

$$2^{x^2-61x} = 64^{3-9x}$$

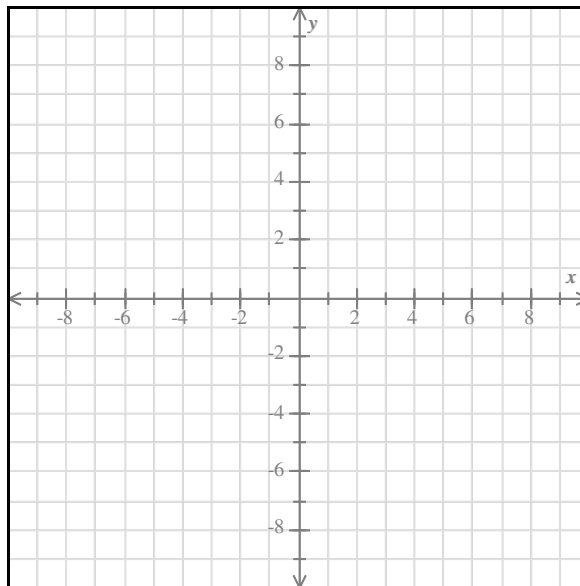
17. Solve for x .

$$125 = 25^{-x+2}$$

18. Graph the function $g(x) = 2 + \log_3(x + 1)$ and give its domain and range using interval notation.



19. Graph the function $g(x) = 4^{x-2}$ and give its domain and range using interval notation.



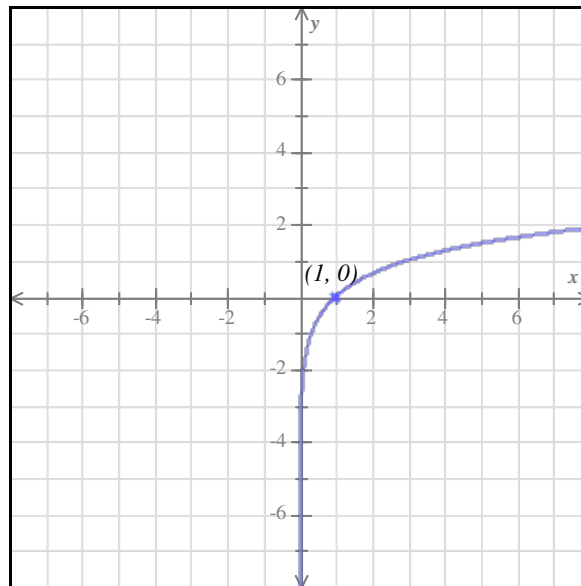
20. Find the domain of the function.

$$f(x) = \log_3 \left(\frac{3}{x+4} \right)$$

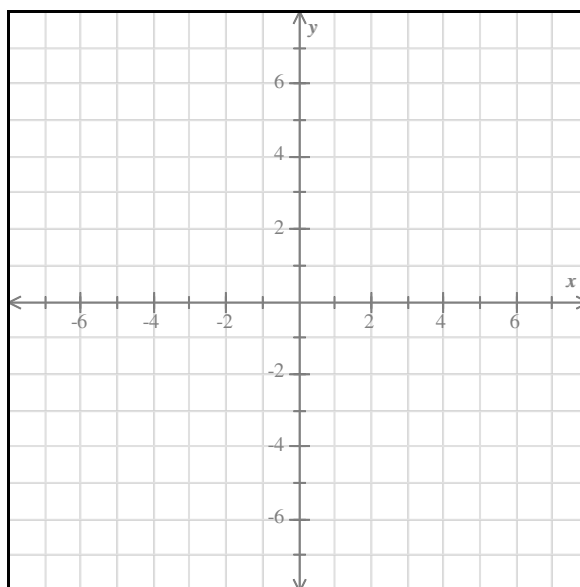
Write your answer as an interval or union of intervals.

21. Below is the graph of $y = \log_3 x$.

Translate it to become the graph of $y = \log_3 (x + 2) + 3$.



22. Graph the exponential function $g(x) = -2^x$.



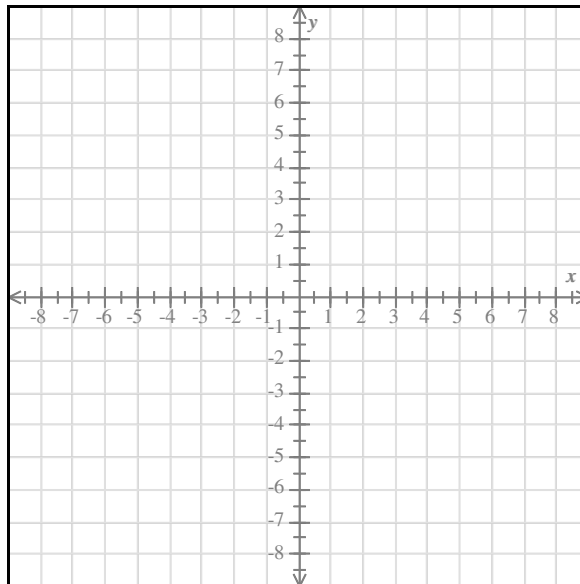
23. Solve the inequality.

$$x^3 + 12x > -8x^2$$

Write your answer as an interval or union of intervals.

24. Graph the rational function $f(x) = \frac{-4}{-x+2}$.

To graph the function, draw the horizontal and vertical asymptotes (if any) and plot at least two points on each piece of the graph.



25. Divide.

$$(8x^3 + 18x^2 + 8x + 4) \div (4x + 1)$$

Your answer should give the quotient and the remainder.

Quotient:

Remainder:

Module C Practice Test #1 Answers for class College Algebra / Math 121C – GARAGE

1.

$$(f-g)(x) = 4x - 3 - \frac{1}{\sqrt{x-2}}$$

Domain of $f-g$: $(2, \infty)$

$$(f \cdot g)(x) = \frac{4x-3}{\sqrt{x-2}}$$

Domain of $f \cdot g$: $(2, \infty)$

2. $(u \circ w)(1) = 16$
 $(w \circ u)(1) = 4$

3. $f(x) = \sqrt{x}$
 $g(x) = 4 - 4x$

4. $(g \circ h)(x) = \frac{2x-1}{2x-2}$

Domain of $g \circ h$: $(-\infty, 1) \cup (1, \infty)$

5. (a) $\left(\frac{f}{g}\right)(-5) = -\frac{3}{7}$

(b) Value(s) that are NOT in the domain of $\frac{f}{g}$: $2, -4$

6. $h^{-1}(x) = \frac{x}{2x-7}$

Domain of $h^{-1} : \left(-\infty, \frac{7}{2}\right) \cup \left(\frac{7}{2}, \infty\right)$

Range of $h^{-1} : \left(-\infty, \frac{1}{2}\right) \cup \left(\frac{1}{2}, \infty\right)$

7. $f^{-1}(x) = (x-4)^2 - 5$

Domain of $f^{-1} : [4, \infty)$

<p>8. (a) $f(x) = \frac{6}{x}, x \neq 0$</p> <p>$g(x) = \frac{6}{x}, x \neq 0$</p> <p>$f(g(x)) = x$</p> <p>$g(f(x)) = x$</p> <p><input checked="" type="radio"/> f and g are inverses of each other</p> <p><input type="radio"/> f and g are <i>not</i> inverses of each other</p>	<p>(b) $f(x) = 2x + 3$</p> <p>$g(x) = 2x - 3$</p> <p>$f(g(x)) = 4x - 3$</p> <p>$g(f(x)) = 4x + 3$</p> <p><input type="radio"/> f and g are inverses of each other</p> <p><input checked="" type="radio"/> f and g are <i>not</i> inverses of each other</p>
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9.			
One-to-one?	<input type="radio"/> Yes <input checked="" type="radio"/> No	<input type="radio"/> Yes <input checked="" type="radio"/> No	<input type="radio"/> Yes <input checked="" type="radio"/> No
One-to-one?	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No

10. $k(x) = (x - 2)^2 - 3$

11. Initial population size: 125 fish
Population size after 8 years: 612 fish

12. 1430 km^2

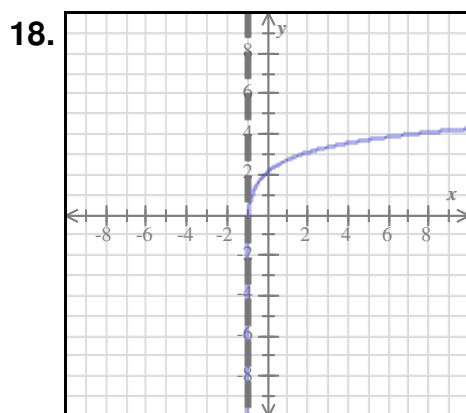
13. Current price: \$3000
Price 9 years from today: \$4233

14. $3^{-4} = \frac{1}{81}$

15. $\log_3 27 = 3$

16. $x = 9, -2$

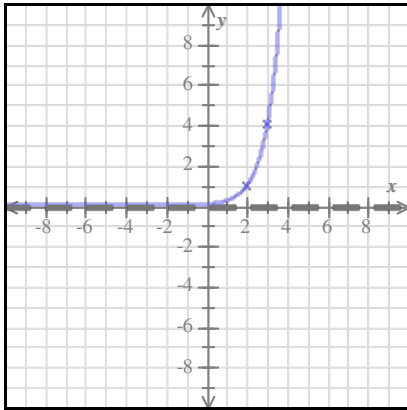
17. $x = \frac{1}{2}$



Domain: $(-1, \infty)$

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

19.

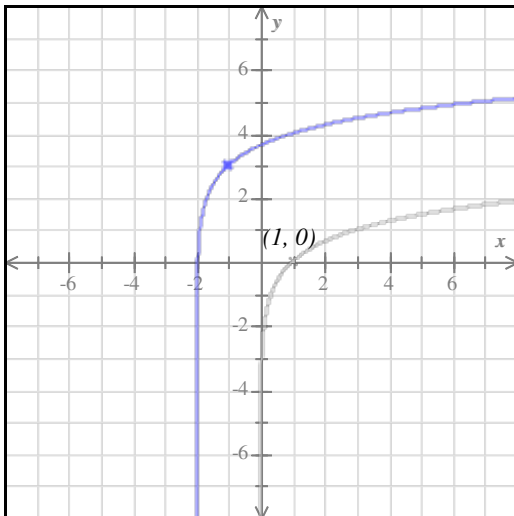


Domain: $(-\infty, \infty)$

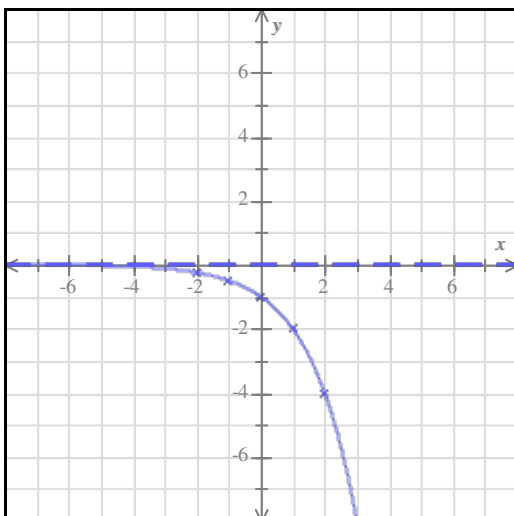
Range: $(0, \infty)$

20. **Domain:** $(-4, \infty)$

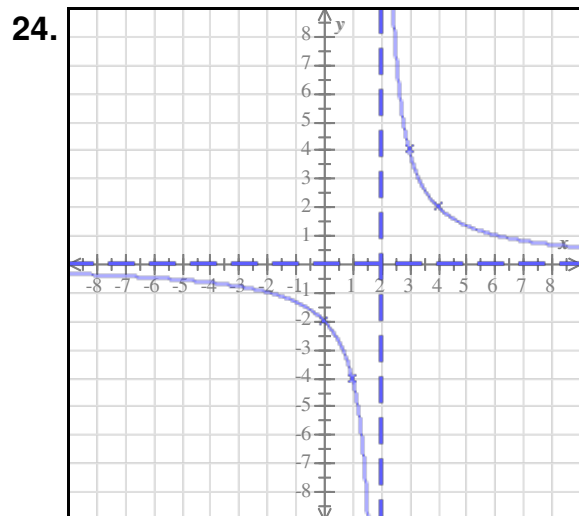
21.



22.



23. $(-6, -2) \cup (0, \infty)$



25. Quotient: $2x^2 + 4x + 1$
Remainder: 3