Student: Aaron Lauve **Date:** 8/26/14 **Time:** 8:50 AM	**Instructor:** Aaron Lauve **Course:** MATH 161.004 - Calculus I - Fall 2014 **Book:** Thomas' Calculus Early Transcendentals, 13e	**Assignment:** Hw1

1. Find the domain and range of the given function.

$$g(x) = \sqrt{25 - x^2}$$

What is the domain of the given function?

☐ (Simplify your answer. Type your answer in interval notation.)

What is the range of the given function?

☐ (Simplify your answer. Type your answer in interval notation.)

2. Find the domain and range of the function.

$$G(t) = \frac{2}{t^2 - 1}$$

The domain of the function G(t) is ☐.
(Type your answer in interval notation. Use integers or fractions for any numbers in the expression.)

The range of the function G(t) is ☐.
(Type your answer in interval notation. Use integers or fractions for any numbers in the expression.)

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3. For a curve to be symmetric about the x-axis, the point (x,y) must lie on the curve if and only if the point $(x, -y)$ lies on the curve. Explain why a curve that is symmetric about the x-axis is not the graph of a function, unless the function is $y = 0$.

A function is a rule that assigns [no more than one / exactly one / at least one] element of the [domain / range] to each element of the [domain. / range.]

If the points (x,y) and $(x, -y)$ lie on a curve, then the curve can only be a function if [$y = -y$. / $y < -y$. / $y > -y$.]

In order to be a function that is symmetric about the x-axis, [most points / every point / one point] on the curve must satisfy this condition. Thus, it follows that a curve that is symmetric about the x-axis is not the graph of a function unless the equation of the curve is [ ].
(Type an equation.)

4. Express the area and perimeter of an equilateral triangle as a function of the triangle's side length x.

A function for the area of an equilateral triangle is $A(x) =$ [ ].
(Type an exact answer, using radicals as needed.)

A function for the perimeter of an equilateral triangle is $P(x) =$ [ ].
(Type an exact answer, using radicals as needed.)

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5. Find the natural domain and graph the function.

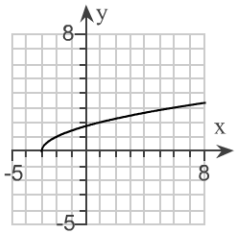
$$f(x) = \sqrt{x - 3}$$

What is the natural domain of the function?

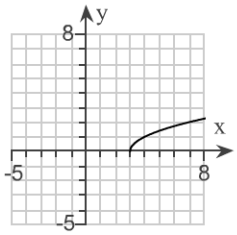
- ◯ A. $[-3, \infty)$
- ◯ B. $(3, \infty)$
- ◯ C. $[3, \infty)$
- ◯ D. $(0, \infty)$

Choose the correct graph of the function.

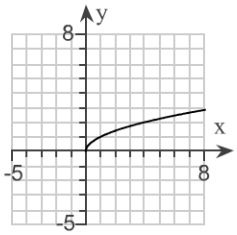
◯ A.



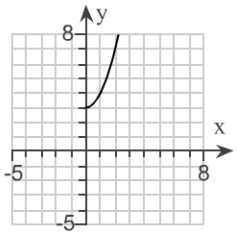
◯ B.



◯ C.



◯ D.



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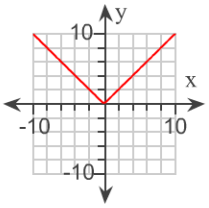
6. Graph the following equations and explain why the graphs are not graphs of functions of x.

(a) $|y| = x$

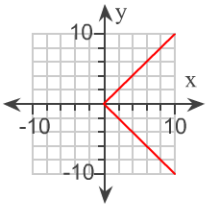
(b) $y^2 = x^2$

(a) Which of the following graphs is the correct graph of the equation $|y| = x$?

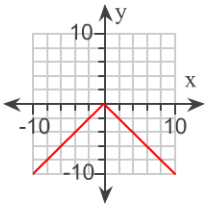
○ A.



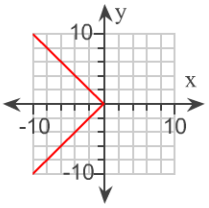
○ B.



○ C.



○ D.



Why is the graph of $|y| = x$ not a graph of a function of x? Choose the correct answer below.

○ A. For each positive value of x, there is only one value of y.

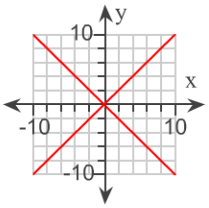
○ B. For each positive value of y, there are two values of x.

○ C. For each positive value of x, there are two values of y.

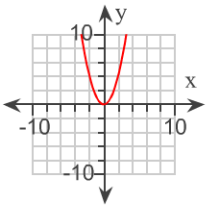
○ D. For each positive value of y, there is only one value of x.

(b) Which of the following is the correct graph of the equation $y^2 = x^2$?

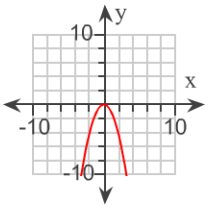
○ A.



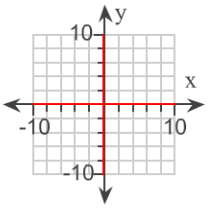
○ B.



○ C.



○ D.



Why is the graph of $y^2 = x^2$ not a graph of a function of x? Choose the correct answer below.

6. (cont.)

- ◯ A. For each value of x, there is only one value of y.
- ◯ B. For each value of y, there is only one value of x.
- ◯ C. For each value of x, there are two values of y.
- ◯ D. For each value of y, there are two values of x.

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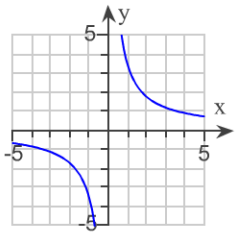
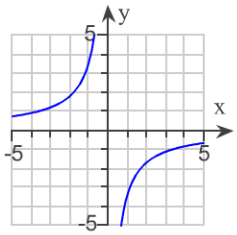
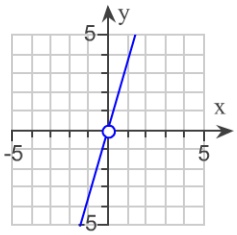
7. Graph the function. What symmetries, if any, does the graph have? Specify the open intervals over which the function is increasing and the open intervals where it is decreasing.

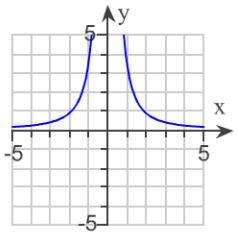
$$y = \frac{7}{2x}$$

Choose the correct graph below.

○ A. 

○ B. 

○ C. 

○ D. 

What symmetries, if any, does the graph have?

○ A. The graph has no symmetry.

○ B. The graph is symmetric about the origin.

○ C. The graph is symmetric about the y-axis.

Specify the open intervals over which the function is increasing and the open intervals where it is decreasing. Select the correct choice below and fill in the answer box(es) within your choice.

(Type your answer in interval notation.)

○ A. The function is increasing on ☐ and is never decreasing.

○ B. The function is increasing on ☐ and is decreasing on ☐.

○ C. The function is decreasing on ☐ and is never increasing.

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8. Determine whether the given function is even, odd, or neither.

$$g(x) = \frac{2}{x^2 - 4}$$

Is the given function even, odd, or neither?

- ○ Even
- ○ Odd
- ○ Neither

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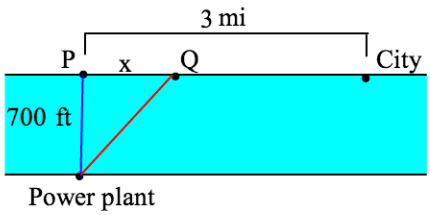
9. A power company has a power plant on a river that is 700 feet wide. To lay a new cable from the plant to a city 3 mi downstream on the opposite side costs \$180 per foot across the river and \$90 per foot across the land. (Recall, 1 mile = 5280 feet.)



a. Suppose the cable goes from the plant to a point Q on the opposite side that is x feet from the point P directly opposite the plant. Write a function C(x) that gives the cost of laying the cable in terms of distance x.

C(x) = ☐

b. Generate a table of values to determine if the least expensive location for point Q is less than 2000 ft or greater than 2000 ft from point P.

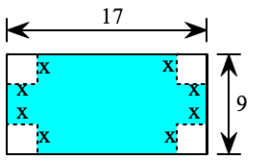
x	C(x)
0	\$☐
1000	\$☐
2000	\$☐
3000	\$☐
4000	\$☐

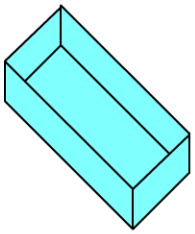
(Round to the nearest dollar as needed.)

Is the least expensive location for point Q less than 2000 feet or greater than 2000 feet from point P?

- ○ less than 2000 feet
- ○ greater than 2000 feet

10. A box with an open top is constructed from a rectangular piece of cardboard with dimensions 9 in by 17 in by cutting out squares of side x at each corner and then folding up the sides as in the figure. Express the volume V of the box in terms of x.





V = ☐

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11. For the given functions, **a.** write a formula for $f \circ g$ and $g \circ f$ and find the **b.** domain and **c.** range of each.

$$f(x) = \sqrt{x+3},\ g(x) = \frac{2}{x}$$

The formula for the composite function $f \circ g$ is ☐.
(Type an exact answer, using radicals as needed.)

The formula for the composite function $g \circ f$ is ☐.
(Type an exact answer, using radicals as needed.)

The domain of $f \circ g$ is ☐.
(Simplify your answer. Use interval notation. Use integers or fractions for any numbers in the expression.)

The domain of $g \circ f$ is ☐.
(Simplify your answer. Use interval notation.)

The range of $f \circ g$ is ☐.
(Simplify your answer. Use interval notation.)

The range of $g \circ f$ is ☐.
(Simplify your answer. Use interval notation.)

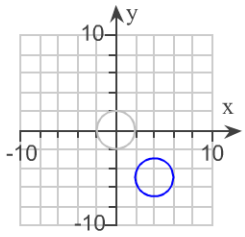
---

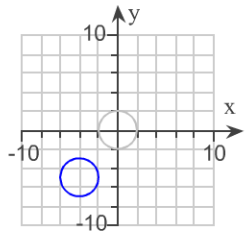
12. The number of units and the directions the graph of the equation is to be shifted are given. Give an equation for the shifted graph. Then sketch the original and shifted graphs together.

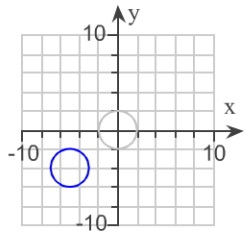
$x^2 + y^2 = 4$; down 5, left 4

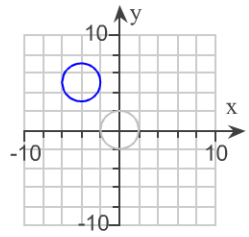
The equation of the shifted graph is $\square = 4$.

Which of the following shows the original graph in gray and the shifted graph in blue?

○ A. 

○ B. 

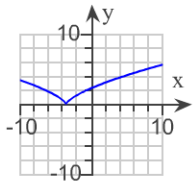
○ C. 

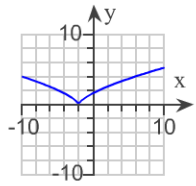
○ D. 

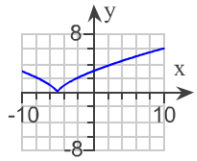
13. Graph the following function.

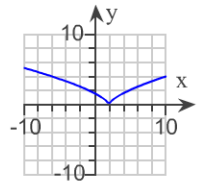
$y = (x + 2)^{2/3}$

Choose the correct graph below.

○ A. 

○ B. 

○ C. 

○ D. 

14. The direction of the graph of the given function and by what factor the function is to be stretched or compressed are given. Give an equation for the stretched or compressed graph.

$y = x^2 - 1$, stretched horizontally by a factor of 6

The equation of the stretched graph is $y = \square$.

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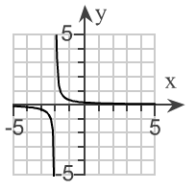
15. Graph the function by starting with the graph of $y = \frac{1}{x}$ and applying an appropriate transformation.

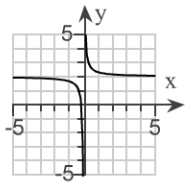
$$y = \frac{1}{3x} + 2$$

Choose the correct graph of $y = \frac{1}{3x} + 2$.

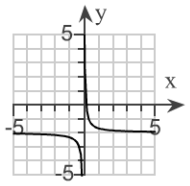
○ A.



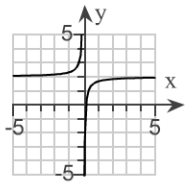
○ B.



○ C.



○ D.



16. You want to make a 55° angle by marking an arc on the perimeter of a 14-in-diameter disk and drawing lines from the ends of the arc to the disk's center. How long should the arc be?

☐ inches (Round to the nearest tenth as needed.)

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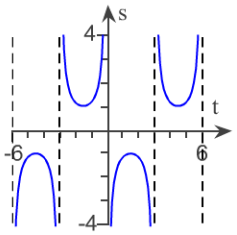
17. Graph the function in the ts-plane (t-axis horizontal, s-axis vertical). What is the period of the function? What symmetry does the graph have?

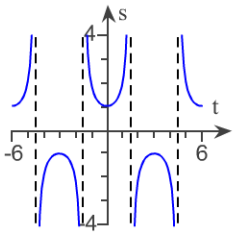
$$s = \csc\left(\frac{\pi t}{3}\right)$$

Choose the correct graph below.

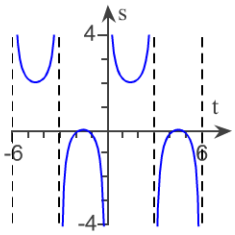
○ A.



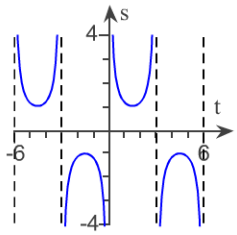
○ B.



○ C.



○ D.



The period is ☐.
(Type an exact answer, using **π** as needed.)

Which of the following describes the graph?

○ A. It does not have any symmetry.

○ B. It is symmetric about the origin.

○ C. It is symmetric about the s-axis.

18. Express the given quantity in terms of **sin** (x) and **cos** (x).

$$\cos\left(-\frac{3\pi}{2}+x\right)$$

$\cos\left(-\frac{3\pi}{2}+x\right) =$ ☐ (Simplify your answer.)

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19. Solve for the angle θ, where $0 \le \theta \le 2\pi$.

$$\cos^2\theta = \frac{2-\sqrt{2}}{4}$$

$\theta =$ ☐

(Use a comma to separate answers as needed. Type an exact answer, using π as needed.)

20. Find all solutions in the interval $[0,2\pi)$.

$\cos 2x - \sin x = 1$

$x =$ ☐

(Type an exact answer, using π as needed. Use a comma to separate answers as needed.)

21. A triangle has side $c = 2$ and angles $A = \frac{\pi}{4}$ and $B = \frac{\pi}{3}$. Find the length a of the side opposite A.

The length of side a is ☐.

(Type an exact answer, using radicals as needed.)

22. Use the law of exponents to simplify.

$$\frac{81^{5.8}}{81^{5.3}}$$

$\frac{81^{5.8}}{81^{5.3}} =$ ☐

(Simplify your answer.)

23. Find the domain and range for the function $g(t) = \sqrt{16 + 6^{-t}}$.

The domain is ☐.

(Simplify your answer. Type an inequality or a compound inequality.)

The range is ☐.

(Simplify your answer. Type an inequality or a compound inequality.)

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24. Find the domain and range for the function $f(x) = \frac{1}{5 + e^{3x}}$.

The domain is ☐.
(Simplify your answer. Type an inequality or a compound inequality. Use integers or fractions for any numbers in the inequality.)

The range is ☐.
(Simplify your answer. Type an inequality or a compound inequality. Use integers or fractions for any numbers in the inequality.)

25. The population of a city is 150,000 and is increasing at a rate of 3.5% each year. Approximately when will the population reach 300,000? (Use a compound growth model.)

The population will reach 300,000 in ☐ years.
(Round up to the next integer.)

26. The half-life of an element is about 15 days. There are 6.1 grams present initially.
a. Express the amount of the element remaining as a function of time t.
b. When will there be 1 gram remaining?

a. Let A(t) be an expression for the amount of the element remaining as a function of time t. Let t be in number of days. What is the expression for the amount of the element remaining as a function of time t?

A(t) = ☐

b. There will be 1 gram remaining after about ☐ days.
(Round to the nearest integer as needed.)

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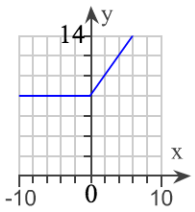
27. Determine from the graph of the following function whether it is one-to-one.

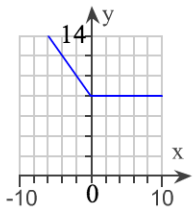
$$f(x) = \begin{cases} 8 - x, & x < 0 \\ 8, & x \geq 0 \end{cases}$$

Choose the correct graph below.

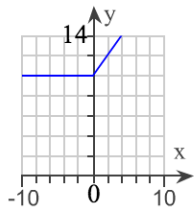
A.



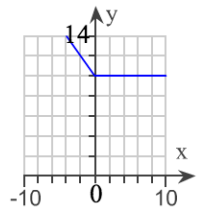
B.



C.



D.



Is f(x) one-to-one?

- Yes
- No

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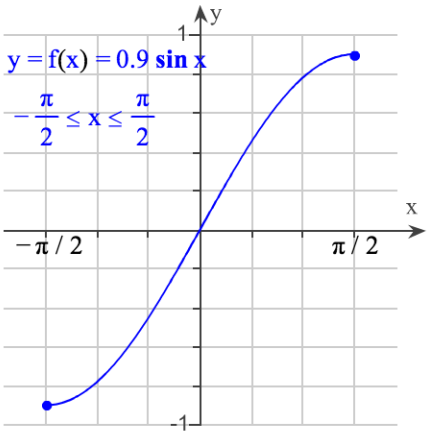
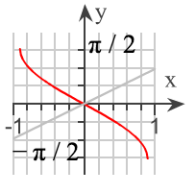
28. Graph $f^{-1}(x)$. Identify the domain and range of $f^{-1}(x)$.

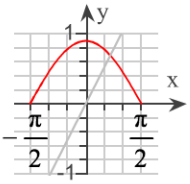


Choose the correct graph of $f^{-1}(x)$.

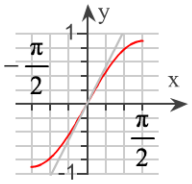
○A.



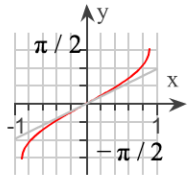
○B.



○C.



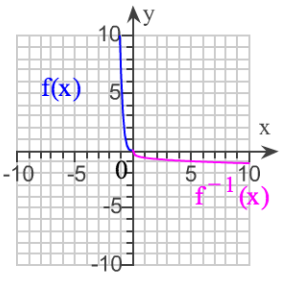
○D.



The domain of $f^{-1}(x)$ is ☐.
(Type your answer in interval notation. Type an integer or a decimal.)

The range of $f^{-1}(x)$ is ☐.
(Type your answer in interval notation. Type an exact answer, using π as needed. Use integers or fractions for any numbers in the expression.)

29. The formula for a function $y = f(x)$ is $f(x) = 6x^4$, $x \le 0$. Find a formula for $f^{-1}(x)$.



$f^{-1}(x) =$ ☐
(Type an exact answer, using radicals as needed.)

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30. A formula for a function $y = f(x)$ is $f(x) = \dfrac{x+7}{x-8}$. Find $f^{-1}(x)$ and identify the domain and range of $f^{-1}(x)$. To check the answer, determine whether $f(f^{-1}(x)) = f^{-1}(f(x)) = x$.

$f^{-1}(x) =$ ☐

What is the domain of $f^{-1}(x)$? Choose the correct answer below.

- A. $(-\infty, \infty), x \neq 1$
- B. $(8, \infty), x \neq 15$
- C. $[-7, 8], x \neq 1$
- D. $(-\infty, 7), x \neq 1$

What is the range of $f^{-1}(x)$? Choose the correct answer below.

- A. $(-\infty, \infty), y \neq 8$
- B. $(-\infty, 7), y \neq -1$
- C. $[-7, 8], y \neq 0$
- D. $(8, \infty), y \neq 11$

Does $f(f^{-1}(x)) = f^{-1}(f(x)) = x$? Choose the correct answer below.

- Yes
- No

31. Use the properties of logarithms to simplify the expression $\ln(\sin\theta) - \ln\left(\dfrac{\sin\theta}{5}\right)$.

$\ln(\sin\theta) - \ln\left(\dfrac{\sin\theta}{5}\right) =$ ☐

(Type an exact answer.)

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32. Solve for t.

a. $e^{-0.2t} = 4$ **b.** $e^{kt} = \frac{1}{2}$ **c.** $e^{(\ln 0.8)t} = 0.9$

a. t = ☐ (Type an exact answer.)

b. t = ☐ (Type an exact answer.)

c. t = ☐ (Type an exact answer.)

33. Solve the equation $e^{\sqrt{t}} = x^5$ for t.

The equation becomes t = ☐.

34. Find the exact value, in radians, of the expression $\arcsin(0)$. Use a graph of $y = \sin^{-1} x$.

$\arcsin(0) =$ ☐

35. Suppose that the range of g lies in the domain of f so that the composite $f \circ g$ is defined. If f and g are one-to-one, can anything be said about $f \circ g$? Give a reason for the answer.

Which of the following explainations is correct for $f \circ g$?

- ○ A. Since f and g are one-to-one, $f \circ g(x) = f(x) \cdot g(x)$.
- ○ B. Since f is an inverse function of g, $f \circ g(x) = x$.
- ○ C. Since f and g are inverse functions of each other, $f \circ g = g \circ f$.
- ○ D. Since f and g are one-to-one, $f \circ g$ is one-to-one.

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36. The half-life of a certain radioactive substance is 12 hours. There are 8 grams present initially.

a. Express the amount of substance remaining as a function of time t.

b. When will there be 1 gram remaining?

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a. Express the amount of substance remaining as a function of time (in days) t.

y = ☐ (Type an exact answer.)

b. When will there be 1 gram remaining?

t = ☐ hours (Round to the nearest hour as needed.)
