

The following 13 multiple choice questions are worth 5 points each.

1. List the transformations needed to transform the graph of  $y = f(x)$  to the graph of  $g(x) = -f(x-1) + 3$ .
  - a. Shift to the right 1 unit, reflect about the  $x$ -axis and shift down 3 units.
  - b. Shift to the right 1 unit, reflect about the  $x$ -axis and shift up 3 units.
  - c. Shift to the right 1 unit, reflect about the  $y$ -axis and shift up 3 units.
  - d. Shift to the left 1 unit, reflect about the  $x$ -axis and shift down 3 units.
  - e. Shift to the left 1 unit, reflect about the  $y$ -axis and shift up 3 units.
  
2. Let  $(-4, -2)$  be a point on the graph of  $y = f(x)$ . Under the transformation  $y = 3f(x) + 2$ , The point  $(-4, -2)$  will be translated to what point?
  - a.  $(-4, -4)$
  - b.  $(-12, -4)$
  - c.  $(-12, 0)$
  - d.  $(-4, 0)$
  - e. None of the preceding.
  
3. Let  $f(x) = \frac{3x}{x-2}$  and  $g(x) = \frac{4}{x+5}$ . Determine the domain of  $f + g$ .
  - a.  $(-\infty, 0) \cup (0, \infty)$
  - b.  $(-\infty, \infty)$
  - c.  $(-\infty, -2) \cup (-2, 5) \cup (5, \infty)$
  - d.  $(-\infty, -3) \cup (-3, 4) \cup (4, \infty)$
  - e.  $(-\infty, -5) \cup (-5, 2) \cup (2, \infty)$

4. If  $f(x) = \sqrt{x}$  and  $g(x) = x+1$ , determine  $(f \circ g)(8)$ .
- $g(2)$
  - $g(-2)$
  - $g(0)$
  - $g(3)$
  - $g(-3)$

5. Determine which two functions are inverses of each other:

$$f(x) = \frac{x+6}{4}$$

$$g(x) = \frac{x-6}{4}$$

$$h(x) = 4x - 6$$

- $f(x)$  and  $g(x)$
- $f(x)$  and  $h(x)$
- $g(x)$  and  $h(x)$
- All are inverses
- None are inverses

6. Let  $f$  and  $g$  be defined by the following tables.

$x$	$f(x)$
-1	1
0	2
1	0
2	-1

$x$	$g(x)$
-1	0
1	1
4	2
3	-1

Determine which of the following is/are true.

I.  $(f \circ g)(3) = 1$

II.  $f^{-1}(g(-1)) = 2$

- Only I is true.
- Only II is true.
- Both are true.
- Neither is true.
- It cannot be determined

7. A piece of wire is 10 inches long. The wire is cut into two pieces and then each piece is bent into a square. Express the sum of the areas of these squares,  $A$ , as a function of the length of the cut,  $x$ .



- a.  $2\left(\frac{x}{2}\right)^2 + 2\left(\frac{5}{2}\right)^2$
- b.  $\left(\frac{x}{4}\right)^2 + \left(\frac{5}{4}\right)^2$
- c.  $\left(\frac{x}{4}\right)^2 + \left(\frac{10-x}{4}\right)^2$
- d.  $\left(\frac{x}{2}\right)^2 + \left(\frac{10-x}{2}\right)^2$
- e.  $2\left(\frac{x}{4}\right)^2 + 2\left(\frac{10-x}{4}\right)^2$
8. Determine which of the following about quadratic functions and their graphs is/are true.
- I. All quadratic functions have a range of  $(-\infty, \infty)$ .
- II. The graph of  $f(x) = -2(x+4)^2 - 3$  has one  $y$ -intercept and no  $x$ -intercepts.
- III. The maximum value of  $P(x) = -20x^2 + 5000x$  is \$312,500 (where  $P(x)$  represents profit).
- a. None are true.
- b. All are true.
- c. Only I and III are true.
- d. Only III is true.
- e. Only II and III are true.

9. Given the following quadratic function, determine which of the following is/are true:

$$f(x) = -2x^2 - 20x - 48$$

- I. The graph's maximum value occurs at  $x = -5$ .
- II. The  $x$ -intercepts of the function occur at  $x = -6$  and  $x = -4$ .
- III. The graph is decreasing on the interval  $(-\infty, -5)$ .
- IV. The  $y$ -intercept of the function is located at  $(0, -24)$ .

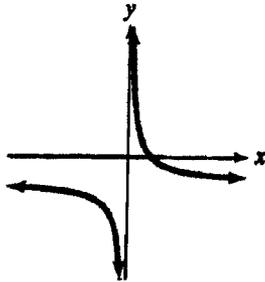
- a. Only III is true.
- b. Only I and III are true.
- c. None are true.
- d. Only I and II are true.
- e. All are true.

10. Determine which of the following represent polynomial functions.

I.  $f(x) = 5x^4 - 2x^2 + x - 7$

II.  $g(x) = 2\sqrt{x} - 5x$

III.



- a. I and II only
- b. II and III only
- c. I and III only
- d. I only
- e. III only

11. Which of the following is/are true about rational functions?

- I. To find the equation of the vertical asymptote(s), set the denominator equal to zero.
- II. All rational functions must have a horizontal asymptote.
- III. The graph of a rational function never crosses a vertical asymptote.

- a. Only I and III are true.
- b. Only II and III are true.
- c. Only II is true.
- d. Only III is true.
- e. All are true.

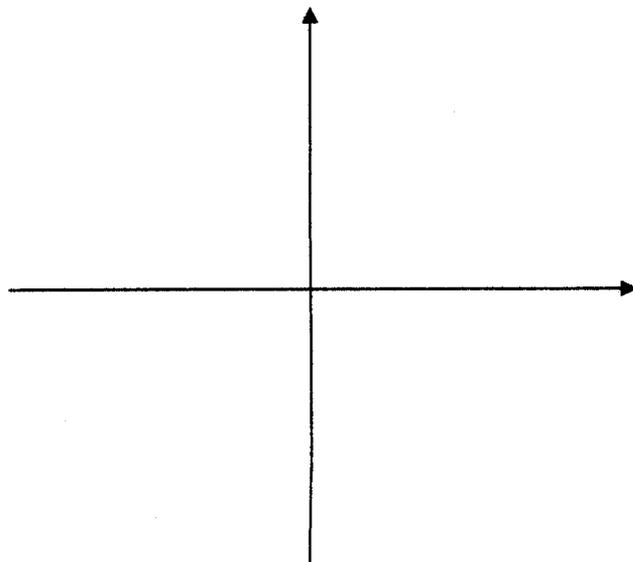
12. The function  $f(x) = 80e^{-0.5x} + 20$  describes the percentage of information,  $f(x)$ , that a particular person remembers  $x$  weeks after learning the information. Determine the percentage of information that is remember after 8 weeks.
- 19.03%
  - 24.37%
  - 23.98%
  - 26.72%
  - 21.47%
13. Let  $f(x) = e^{x+8} - 2$ . Determine which of the following is/are true about the graph of  $f$ .
- The domain is  $(-\infty, \infty)$ .
  - The range is  $(-2, \infty)$ .
  - The equation of the asymptote is  $x = -5$ .
- Only I and II are true.
  - All are true.
  - None are true.
  - Only II is true.
  - Only II and III are true.

Name \_\_\_\_\_ Instructor \_\_\_\_\_ Section \_\_\_\_\_

Problems 14-18 are free response. Pages 6 and 7 should be turned in with your Answer Sheet.

14. (6 pts) If  $f(x) = \frac{1}{x^2 - 6}$  and  $g(x) = \sqrt{x}$ , find  $(f \circ g)(x)$  and the domain of  $(f \circ g)$ . (To receive credit please show your work.)

15. (8 pts) Let  $f(x) = \sqrt{x+8}$ . Find the equation for  $f^{-1}(x)$ .  
 (To receive credit please show your work.) Graph  $f$  and  $f^{-1}$  on the same set of axes.  
 Use interval notation to give the domain and range of  $f$  and  $f^{-1}$ .



	$f$	$f^{-1}$
Domain	_____	_____
Range	_____	_____

16. (8 pts) Consider the function:  $g(x) = \frac{x+4}{x+2}$ .

Find the following:

a. x-intercept \_\_\_\_\_

c. Equation of horizontal asymptote \_\_\_\_\_

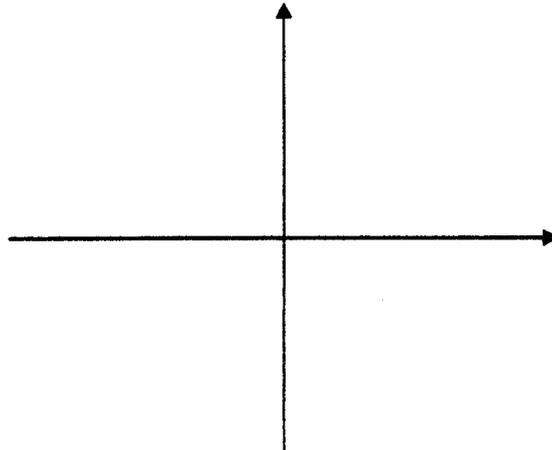
b. y-intercept \_\_\_\_\_

d. Equation of vertical asymptote \_\_\_\_\_

e. Graph the function;  
include the above characteristics

f. Using your graph,  
determine where  $g(x) \leq 0$ .

\_\_\_\_\_



17. (7 pts) The area of a rectangular garden is 140 square feet. The garden is to be enclosed on three sides by a brick wall which costs \$31 per foot and on one side by a fence which costs \$9 per foot. Express the cost to enclose the garden,  $C$ , as a function of one of its dimensions,  $x$ .

18. (6 pts) Use the following description to write an equation of a polynomial function with the characteristics:

- a. Touches the  $x$ -axis and turns around at  $-6$  and  $2$ .
- b. Crosses the  $x$ -axis at  $0$  and  $-4$ .

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Question	Answer
1	B
2	A
3	E
4	A
5	B
6	A
7	C
8	E
9	D
10	D
11	A
12	E
13	A

Name \_\_\_\_\_ Instructor \_\_\_\_\_ Section \_\_\_\_\_

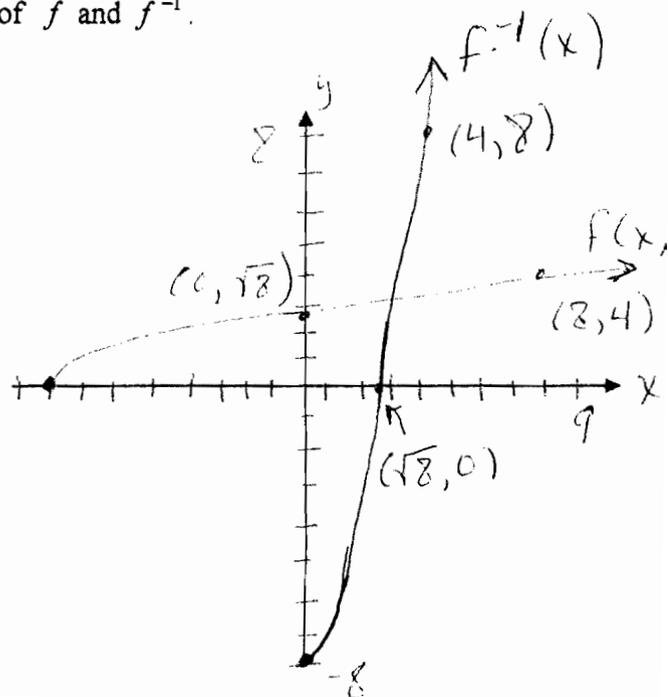
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14. (6 pts) If  $f(x) = \frac{1}{x^2 - 6}$  and  $g(x) = \sqrt{x}$ , find  $(f \circ g)(x)$  and the domain of  $(f \circ g)$ . (To receive credit please show your work.)

$$\begin{aligned} (f \circ g)(x) &= f(g(x)) \text{ for all } x \text{ in the domain of } g. \\ &= f(\sqrt{x}) \text{ for } x \geq 0 \\ &= \frac{1}{(\sqrt{x})^2 - 6} \text{ for } x \geq 0 \\ &= \frac{1}{x - 6} \text{ for } x \geq 0 \text{ and } x \neq 6 \end{aligned}$$

15. (8 pts) Let  $f(x) = \sqrt{x+8}$ . Find the equation for  $f^{-1}(x)$ . (To receive credit please show your work.) Graph  $f$  and  $f^{-1}$  on the same set of axes. Use interval notation to give the domain and range of  $f$  and  $f^{-1}$ .

$$\begin{aligned} y &= \sqrt{x+8} \\ x &= \sqrt{y+8} \\ x^2 &= y+8 \\ x^2 - 8 &= y \\ f^{-1}(x) &= x^2 - 8 \text{ for } x \geq 0 \end{aligned}$$



	$f$	$f^{-1}$
Domain	$[-8, \infty)$	$[0, \infty)$
Range	$[0, \infty)$	$[-8, \infty)$

16. (8 pts) Consider the function:  $g(x) = \frac{x+4}{x+2}$ .

Find the following:

a. x-intercept  $(-4, 0)$

c. Equation of horizontal asymptote  $y = 1$

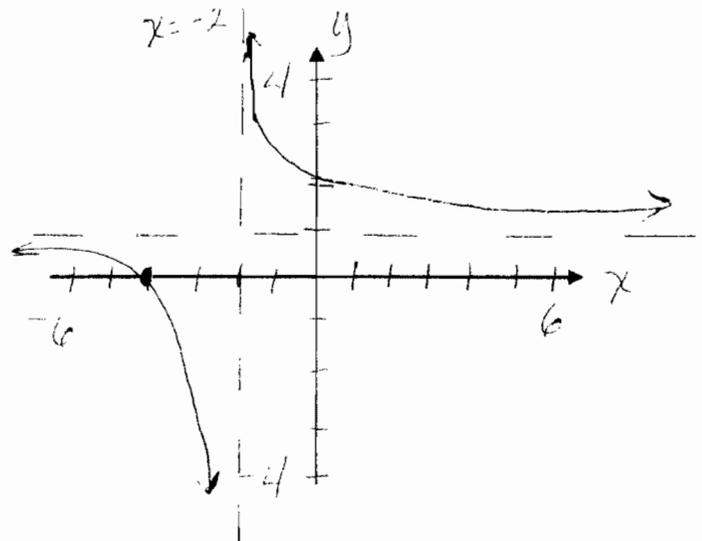
b. y-intercept  $(0, 2)$

d. Equation of vertical asymptote  $x = -2$

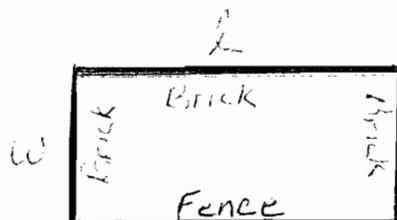
e. Graph the function; include the above characteristics

f. Using your graph, determine where  $g(x) \leq 0$ .

$[-4, -2)$



17. (7 pts) The area of a rectangular garden is 140 square feet. The garden is to be enclosed on three sides by a brick wall which costs \$31 per foot and on one side by a fence which costs \$9 per foot. Express the cost to enclose the garden,  $C$ , as a function of one of its dimensions,  $l$ .



Let  $w =$  width of garden  
 $l =$  length of garden

$$\text{Cost} = \$31(2w + l) + \$9(l)$$

$$lw = 140$$

$$C(l) = 31\left(2\left(\frac{140}{l}\right) + l\right) + 9l$$

$$w = \frac{140}{l}$$

$$C(l) = \frac{8680}{l} + 31l + 9l$$

$$C(l) = \frac{8680}{l} + 40l$$

18. (6 pts) Use the following description to write an equation of a polynomial function with the characteristics:

- a. Touches the  $x$ -axis and turns around at  $-6$  and  $2$ .
- b. Crosses the  $x$ -axis at  $0$  and  $-4$ .