The following 14 multiple choice questions are worth 5 points each.

1. **Let $f(x)=x^2-8$ and $g(x)=\sqrt{x+4}$. Determine $(f\circ g)(x)$ and its domain.**

   a. $(f\circ g)(x)=\sqrt{x^2-4};\quad D:[2,\infty)$

   b. $(f\circ g)(x)=\sqrt{x^2-4};\quad D:[-4,\infty)$

   c. $(f\circ g)(x)=x-4;\quad D:(-\infty,\infty)$

   d. $(f\circ g)(x)=x-4;\quad D:[-4,\infty)$

   e. $(f\circ g)=\left(x^2-8\right)\left(\sqrt{x+4}\right);\ D:[-4,\infty)$

2. **Suppose that *f* and *g* are defined by the following sets of ordered pairs:**

   ***f*: { (3,5), (5,11), (7,10), (11,12)}**

   ***g*: { (2,5), (4,11), (5,6), (12,14) }**

   Determine the value of $\left(g\circ f^{-1}\right)(11)$.

   a. 2
   b. 4
   c. 6
   d. 12
   e. 14

3. **Determine the inverse of:** $f(x)=\frac{x}{a}+b$, *for* $a\neq 0$.

   a. $f^{-1}(x)=\frac{a}{x}+\frac{1}{b}$

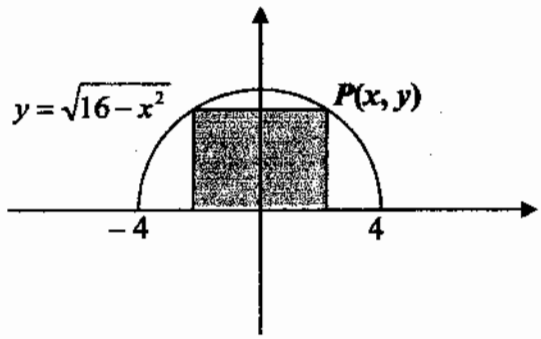
   b. $f^{-1}(x)=\frac{a}{x}-b$

   c. $f^{-1}(x)=x-ab$

   d. $f^{-1}(x)=ax-ab$

   e. $f^{-1}(x)=ax-b$

4. The figure below shows a rectangle with two vertices on a semi-circle of radius 4 and two vertices on the x-axis. Let P(x,y) be the vertex that lies in the first quadrant.



Express the area of the rectangle, A, as a function of x.

a. $A(x)=\sqrt{32x-2x^3}$

b. $A(x)=x\sqrt{16-x^2}$

c. $A(x)=2x\sqrt{16-x^2}$

d. $A(x)=4x+2\sqrt{16-x^2}$

e. None of the preceding

5. **Solve:** $(x-3)(x-1)=10$

   a. $x=2\pm 2\sqrt{11}$

   b. $x=2\pm\sqrt{3}$

   c. $x=2\pm\sqrt{22}$

   d. $x=4\pm\sqrt{11}$

   e. $x=2\pm\sqrt{11}$

6. **Determine which of the following statements is true.**

   a. **Every quadratic equation has two (2) distinct real number solutions.**

   b. **If a parabola has a maximum value of –6 which occurs at $x=11$, its range is $(-\infty,11]$.**

   c. **The vertex of the parabola , $f(x)=2(x-11)^2-50$ cannot be determined.**

   d. **Quadratic functions cannot have a range of (-∞, ∞)**

   e. **The equation of the axis of symmetry of $f(x)=7(x+8)^2+10$ is $x=8$.**

7. **Determine which of the following is true. The function,**

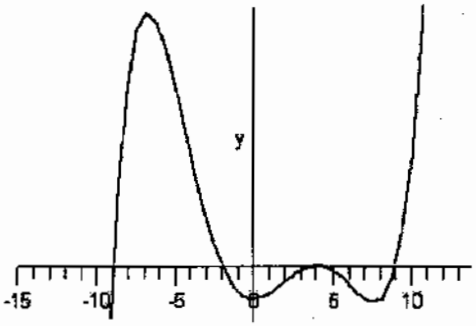
   $f(x)=4-\frac{3}{x^5}$

   a. **is not a polynomial function.**
   b. **is a polynomial of degree 5.**
   c. **is a polynomial of degree -5.**
   d. **is a polynomial of degree 3.**

8. A rectangular playground is to be fenced off and divided in two smaller rectangles by another fence parallel to one side of the playground. 1200 feet of fencing is used. What is the maximum area that can be enclosed?

a. **50,000 square feet**
b. **60,000 square feet**
c. **70,000 square feet**
d. **80,000 square feet**
e. **90,000 square feet**

9. Which of the following functions is the best possible match for the given graph?



a. $f(x) = a(x-4)^2(x-9)(x+9)(x+2),\ a>0$

b. $f(x) = a(x-4)^2(x-9)(x+9)(x+2),\ a<0$

c. $f(x) = ax^2(x-4)^2(x-9)(x+9)(x+2),\ a<0$

d. $f(x) = ax^2(x-4)^2(x-9)(x+9)(x+2),\ a>0$

e. $f(x) = a(x-4)(x-9)(x+9)(x+2),\ a>0$

10. Solve for x: $(x-12)(x+15)(x-25)>0$

a. $x=12,\ x=-15,\ x=25$

b. $(-15,12)\cup(25,\infty)$

c. $(-\infty,-15)\cup(12,25)$

d. $x=-12,\ x=15,\ x=-25$

e. $(-15,0)\cup(12,25)$

11. Given the following rational function, $f(x)=\frac{4x^2}{x^2-9}$, determine which of the following is/are true.

I. The graph passes through the origin.
II. The horizontal asymptote is $y = 4$.
III. The horizontal asymptote is $y = 0$.
IV. The vertical asymptote is $x = 3$.
V. The vertical asymptotes are $x = -3$ and $x = 3$.

a. I, II, and III
b. I, III, and V
c. I, II, and IV
d. I, II, and V
e. II, and V

12. Determine the y-intercept and horizontal asymptote of $f(x) = e^x + b,\ b > 0$.

	y-intercept	horizontal asymptote
a.	$(0,b)$	$y=0$
b.	$(0,1)$	$y=0$
c.	$(0,1)$	$y=b$
d.	$(0,b+1)$	$y=b$
e.	$(0,b+1)$	$y=e$

13. In college, we study large volumes of information – information that we often do not retain very long. The following model describes the percentage of information, f(x), that a particular person remembers x-weeks after learning the information.

$$f(x) = 80e^{-0.5x} + 20$$

Determine the approximate percentage that is remembered after 14 weeks (approximately 1 semester).

a. 100%
b. 80%
c. 40%
d. 20%
e. 0%

14. Suppose that $10,000 is invested in an account at an interest rate of 4.5% compounded semi-annually. Assuming no deposits or withdrawls, how much will be in the account after 3 years.

Note that $A(t) = P\left(1 + \frac{r}{n}\right)^{nt}$

a. $11,428.25
b. $11,350.00
c. $13,022.60
d. $10,690.30
e. $11,445.38

Name _____ **Instructor** _____

Section _____

Questions 15-17 are free response. Pages 7and 8 should be turned in with your answer sheet.

15. Given the following rational function, sketch the graph and indicate all of the key features. [12 points]

$$f(x)=\frac{x-20}{x+10}$$

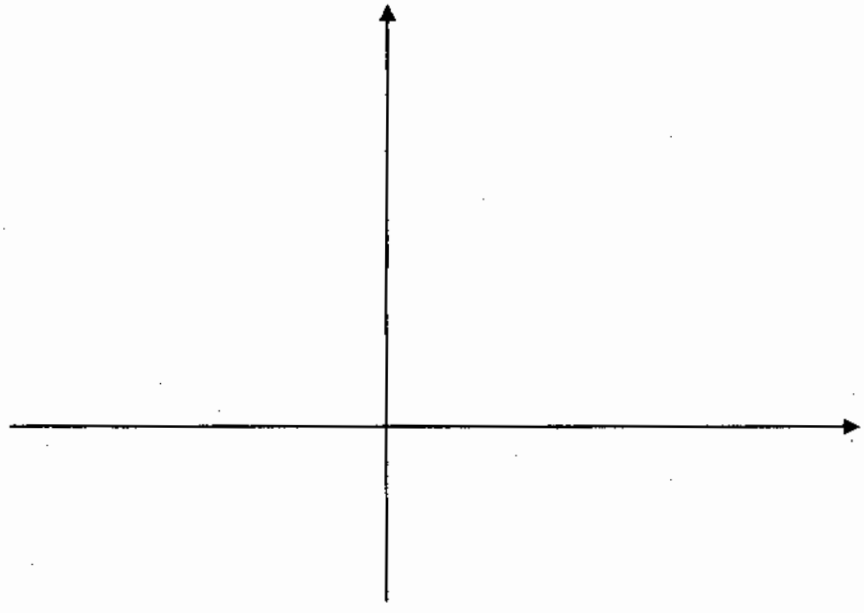
a. Vertical Asymptote (s) _____

b. Horizontal Asymptote _____

c. x-intercept (s) _____

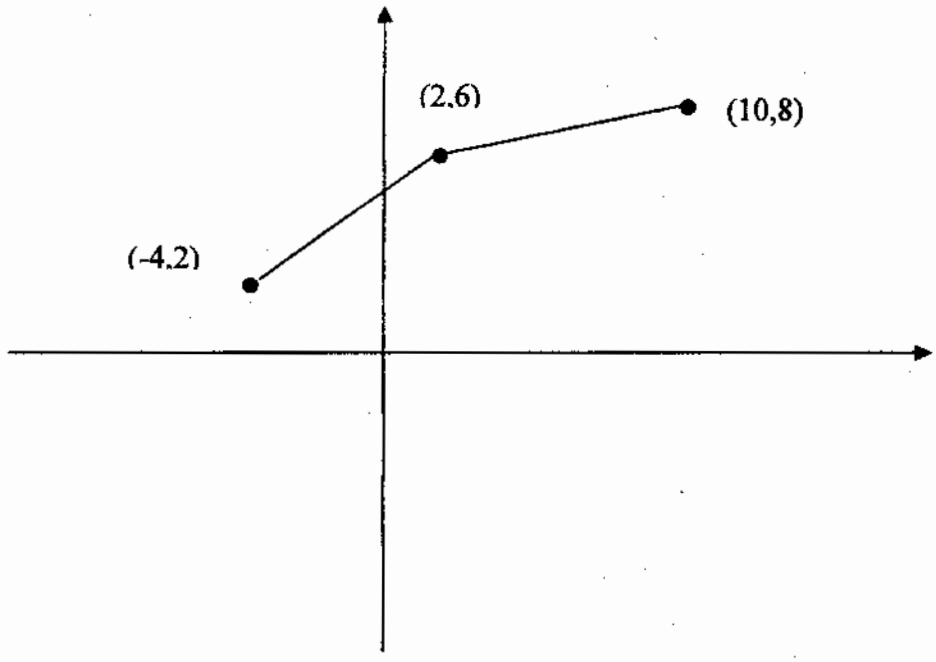
d. y-intercept _____

e. Solve the inequality, $\frac{x-20}{x+10} > 0$ **and express your answer in interval notation.** _____



16. Let $h(x)=\sqrt{x^2+1}$. If $(f\circ g)(x)=h(x)$, determine $f(x)$ and $g(x)$. **[6 points]**

17. Given the graph of $f(x)$ below, sketch the graph of $f^{-1}(x)$ on the same axes and complete the following. **[12 points]**



a. The domain of f is: _____
b. The range of f is: _____
c. The domain of f^{-1} is: _____
d. The range of f^{-1} is: _____

Multiple Choice Key

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