

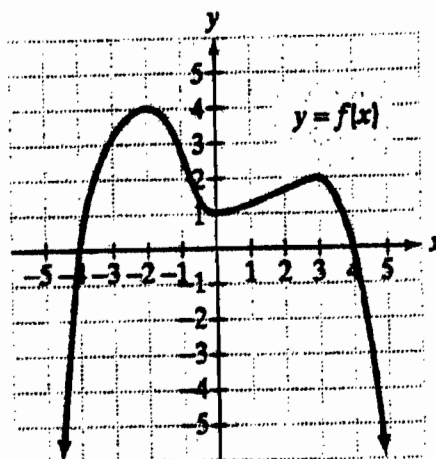
The following 21 multiple choice questions are worth 5 points each.

1. Write the equation of the line that is perpendicular to the line with equation $3x + y - 5 = 0$ and has x -intercept $\frac{2}{3}$. What is the y -intercept of the line you found?

- a. $\frac{2}{9}$
- b. 2
- c. 5
- d. $\frac{2}{3}$
- e. $-\frac{2}{9}$

2. Given the graph of f to the right, determine which of the following is true.

- a. $f(3) = -1$
- b. The domain of f is $[-4, 4]$
- c. f is increasing on the intervals $(1, 2)$ and $(-\infty, 4)$
- d. The range of f is $(-\infty, 4]$
- e. f has an inverse function



3. Solve: $3x^2 - 6x = 4$

- a. no real solution
- b. $x = 1 \pm 2\sqrt{21}$
- c. $x = \frac{3 \pm \sqrt{21}}{3}$
- d. $x = \frac{3 \pm \sqrt{3}}{3}$
- e. $x = 1 \pm \sqrt{14}$

4. Given $f(x) = 2x^2 - x + 2$, evaluate the difference quotient: $\frac{f(x+h) - f(x)}{h}$
- $4x + 2h$
 - $2h - 1$
 - $4x + 2h - 1$
 - $x + 2h + 4$
 - $2x + 2h + 4$
5. Let $(-3, -4)$ be a point on the graph of $y = f(x)$. Under the transformation $y = \frac{1}{2}f(x+2) - 3$, the point $(-3, -4)$ will be translated to what point?
- $(-5, -5)$
 - $(-5, -7)$
 - $(-1, -5)$
 - $(-2.5, -7)$
 - $(-1, -4.5)$
6. The area of a rectangular garden is 180 square feet. The garden is to be enclosed on three sides by a brick wall which costs \$20 per linear foot and on one side by a fence which costs \$14 per linear foot. Express the cost to enclose the garden, C , as a function of one its dimensions x , where one side x has the brick wall and the opposite side x has the fence.
- $C(x) = 3600 - 6x$
 - $C(x) = \frac{3600}{x} + 48x$
 - $C(x) = 40y + 34x$
 - $C(x) = \frac{360}{x} + 34x$
 - $C(x) = \frac{7200}{x} + 34x$

7. Determine which of the following is/are true for the polynomial function:

$$P(x) = 3.2(x-3)^2(x+1)^3(x+5)$$

- I. $P(x)$ has x -intercepts at $x = -5$, $x = -1$ and $x = 3$.
- II. For $P(x)$, as $x \rightarrow -\infty$, $P(x) \rightarrow \infty$.
- III. $P(x) < 0$ on the interval $(-5, -1)$.
- IV. $P(x)$ has a y -intercept at $(0, 144)$.

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

8. Let $f(x) = 3\sqrt{x-4} + 5$. Determine the equation for $f^{-1}(x)$, where the domain is $[5, \infty)$.

- a. $f^{-1}(x) = \frac{(x+4)^2}{3} - 5$
- b. $f^{-1}(x) = \frac{(x-5)^2}{9} + 4$
- c. $f^{-1}(x) = \frac{(x-5)^2}{3} - 4$
- d. $f^{-1}(x) = -3\sqrt{x+4} - 5$
- e. $f^{-1}(x) = (x-5)^2 + 4$

9. Determine which of the following is/are true.

- I. The graph of $f(x) = 2(x+5)^2 - 3$ has one y -intercept and two x -intercepts.
- II. The range of $f(x) = 2(x+5)^2 - 3$ is $[-5, \infty)$.
- III. $f(x) = 2(x+5)^2 - 3$ is decreasing on $(-\infty, -3)$.

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

10. Your college fund decreased from \$100,000 to \$60,000 in the last three months of 2008. Fearing further losses, your parents take the remaining \$60,000 and invest it in a CD (Certificate of Deposit) at 4% compounded annually. How long will it take for the college fund to return to its original value of \$100,000.

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

- a. 4.0 years
b. 16.3 years
c. 13.0 years
d. 10.5 years
e. 8.2 years
11. Solve: $\log_4(x-6) = 2 - \log_4(x)$

- a. $x = 8$
b. $x = 8, x = -2$
c. No solution
d. $x = -2$
e. $x = 4$

12. Use the properties of logarithms to expand the logarithmic expression as much as possible.

$$\ln \left[\frac{z^9 \sqrt{x^2 + 2}}{(y+1)^6} \right]$$

- a. $9 \ln z + 2 \ln(x^2 + 2) - \frac{1}{6} \ln(y+1)$
b. $9 \ln z + \frac{1}{2} \ln(x^2 + 2) - 6 \ln(y+1)$
c. $9 \ln z + \ln(x+2) - 6 \ln(y+1)$
d. $\frac{9 \ln z \cdot 2 \ln(x^2 + 2)}{6 \ln(y+1)}$
e. $9 \ln z + \ln x + \ln 2 - 6 \ln y$

13. Consider the function $y = \log_2(x+1) + 3$. Which of the following is/are true?

- I. The range of the function is $(0, \infty)$.
- II. The function has an asymptote at $y = 5$.
- III. The y -intercept is $(0, 5)$.

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

14. The exponential growth models below describe the population of the indicated country, A , in millions, t years after 2003.

Canada: $A = 32.2e^{0.003t}$

Uganda: $A = 25.6e^{0.03t}$

Which of the following statements is true?

- a. In 2012, Uganda's population will exceed Canada's.
- b. In 2003, Canada's population exceeded Uganda's by 660,000.
- c. Canada's growth rate is higher than Uganda's growth rate.
- d. In 2003, Uganda's population was ten times that of Canada's.
- e. None of these statements is true.

15. When the outside air temperature is between 72° and 96° Fahrenheit, the temperature in an enclosed vehicle climbs by 43° in the first hour.

The function $f(x) = 13.4 \ln x - 11.6$ models the temperature increase, $f(x)$, in degrees Fahrenheit, after x minutes. Suppose you leave your dog, Gypsy, in the car for 10 minutes on a nice spring day when the outside temperature is 76° . How hot will the interior of the car be when you return?

- a. 89.4°
- b. 83.2°
- c. 76.0°
- d. 95.3°
- e. 80.1°

16. The Statue of Liberty is about 305 feet tall. If the angle of depression from the top of the statue to a ship is 24° , how far is the ship from the statue's base?
- 651 feet
 - 136 feet
 - 124 feet
 - 685 feet
 - 143 feet
17. If $\sin \theta = -\frac{12}{13}$, and $\tan \theta > 0$, find the exact value of $\sec \theta$.
- $\sec \theta = -\frac{13}{5}$
 - $\sec \theta = \frac{13}{5}$
 - $\sec \theta = -\frac{5}{13}$
 - $\sec \theta = -\frac{13}{12}$
 - $\sec \theta = \frac{13}{12}$
18. Determine the exact value of $\sin 200^\circ \cos 25^\circ + \cos 200^\circ \sin 25^\circ$
- 0.996
 - $-\frac{\sqrt{3}}{2}$
 - $\frac{1}{2}$
 - $-\frac{\sqrt{2}}{2}$
 - 0.087

19. Write the equation of the sine function that has:

Amplitude: 3

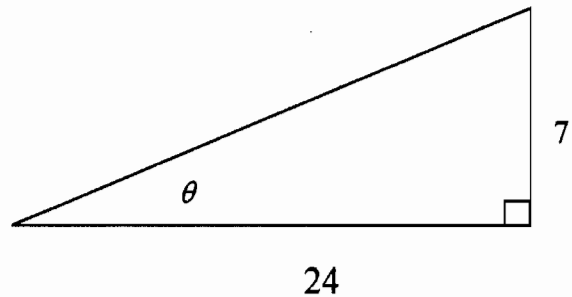
Period: π

Phase shift: $\frac{\pi}{2}$ (to the right)

- a. $y = \sin(2x - \pi) + 3$ c. $y = 2 \sin\left(x + \frac{\pi}{2}\right)$
 b. $y = 2 \sin\left(\pi x - \frac{\pi}{2}\right)$ d. $y = 3 \sin(x + \pi)$
 e. $y = 3 \sin(2x - \pi)$

20. Given the right triangle to the right, determine $\cos 2\theta$.

- a. $\frac{527}{625}$ c. $\frac{1152}{625}$
 b. $\frac{576}{625}$ d. $\frac{49}{625}$
 e. $\frac{336}{625}$



21. Solve: $7 \sin x - \sqrt{3} = 5 \sin x$, $0 \leq x < 2\pi$

- a. $x = \frac{\pi}{3}$, $x = \frac{4\pi}{3}$ c. $x = \frac{\pi}{3}$
 b. $x = \frac{\pi}{3}$, $x = \frac{2\pi}{3}$ d. $x = \frac{4\pi}{3}$, $x = \frac{5\pi}{3}$
 e. $x = \frac{\pi}{6}$, $x = \frac{5\pi}{6}$

Name _____ Instructor _____ Section _____

Questions 22 - 24 are free response.

Pages 8 and 9 should be turned in with your answer sheet.

22. (32 pts) For each of the following functions fill in the blanks for the indicated characteristics. Answers must be exact. Use interval notation for domain and range. Put "none" for any characteristic that does not exist.

$$f(x) = \frac{1}{x^2} + 3$$

Domain _____

Range _____

Equations of asymptotes _____

$$g(x) = \log_5(x+5) + 3$$

Domain _____

Range _____

Equation of asymptote _____

y-intercept _____

$$h(x) = 2^x - 16$$

Domain _____

Range _____

Equation of asymptote _____

x-intercept _____

$$k(x) = 3 \cos(3x) + 2$$

Domain _____

Range _____

Equation of asymptote _____

y-intercept _____

23. (6 pts) Let $\theta = \frac{11\pi}{3}$. (To receive credit show all correct work.)
- Draw θ in standard position.
 - Determine the reference angle θ' and show its location on the picture.
 - Determine the exact value of $\csc\theta'$.
 - Determine the exact value of $\csc\theta$.

24. (7 pts) Prove: $\frac{\cos x}{1 + \sin x} + \frac{\sin x}{\cos x} = \frac{1}{\cos x}$

M115 08F – Final Exam

Multiple Choice Key – White

Question	Answer Choice
1	E
2	D
3	C
4	C
5	A
6	E
7	E
8	B
9	B
10	C
11	A
12	B
13	A
14	A
15	D
16	D
17	A
18	D
19	E
20	A
21	B