

The following 24 multiple choice questions are worth 6 points each.

1. Given $\sin \theta = a$ with $\tan \theta < 0$ and $a > 0$, write an expression for $\cos(2\theta)$ in terms of a .
 - a. $2a$
 - b. $2\sqrt{1 - a^2}$
 - c. $1 - 2a^2$
 - d. $\sqrt{1 - 2a^2}$
 - e. None of the preceding

2. Which of the following is equivalent to $\cos\left(\frac{2\pi}{3} - \theta\right)$?
 - a. $\frac{1}{2}(\cos \theta - \sqrt{3} \sin \theta)$
 - b. $-\frac{1}{2}(\sqrt{3} \cos \theta + \sin \theta)$
 - c. $-\frac{1}{2}(\cos \theta - \sqrt{3} \sin \theta)$
 - d. $\frac{1}{2}(\cos \theta + \sqrt{3} \sin \theta)$
 - e. $-\frac{1}{2} - \cos \theta$

3. A triangle has sides of length 45, 32, and 20. Determine the expression you would use to approximate the measure of the smallest angle, α , of the triangle.
 - a. $32^2 = 20^2 + 45^2 - 2(20)(45) \cos \alpha$
 - b. $45^2 = 20^2 + 32^2 - 2(20)(32) \cos \alpha$
 - c. $20^2 = 45^2 + 32^2 - 2(45)(32) \cos \alpha$
 - d. The angle cannot be approximated

4. Consider the function $y = 3 \cos(2x - \pi)$. Which of the following statements is/are true?

I. The period is 2π .

II. The graph is a shift of the graph $y = 3 \cos x$ by $\frac{\pi}{2}$ units to the right.

III. The graph has an x -intercept at $(\frac{\pi}{2}, 0)$.

a. I and II only

d. II only

b. II and III only

e. III only

c. I only

5. Which of the following is equivalent to $\frac{1 + \sec \theta}{\csc \theta}$?

a. $1 + \tan^2 \theta + \sec \theta$

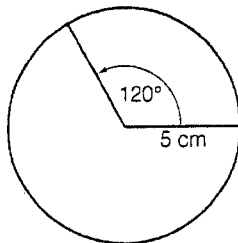
d. $\sec \theta - \cos \theta$

b. $1 + \tan^2 \theta + \sin \theta$

e. $\sin \theta + \tan \theta$

c. $\cos \theta + \cot \theta$

6. Compute the area of the sector shown below. Round your answer to the nearest hundredth.



a. 5.24 cm^2

d. 600.00 cm^2

b. 24.00 cm^2

e. 52.36 cm^2

c. 26.18 cm^2

7. Simplify $\log_3 \frac{4x}{25y}$. Which of the following is/are correct?

I. $\log_3 \frac{4x}{25y} = \frac{\log_3 4x}{\log_3 25y}$

II. $\log_3 \frac{4x}{25y} = \log_3 4 + \log_3 x + 2\log_3 5 - \log_3 y$

III. $\log_3 \frac{4x}{25y} = 2\log_3 2 + \log_3 x - 2\log_3 5 - \log_3 y$

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

8. Evaluate: $\log_2 39$, correct to two decimal places.

- a. 0.05
b. 5.82
c. 1521.00
d. 5.29
e. None of the preceding

9. Use the properties of logarithms to rewrite the following:

$$\frac{1}{2} [3 \log x + 2 \log y - 4 \log z]$$

- a. $\log \frac{\sqrt{x^3 y^2}}{4z}$
b. $\log \frac{x^3 y^2}{z^4}$
c. $\log \sqrt{\frac{x^3 y^2}{z^4}}$
d. $\log \frac{\sqrt{6xy}}{4z}$
e. None of the preceding

17. Let $g(x) = 3x + 7$. What is $g^{-1}(1)$?

- a. 11
- b. 10
- c. $\frac{22}{3}$
- d. -2
- e. g does not have an inverse.

18. Solve: $\frac{4}{x+3} + \frac{3}{x-6} = \frac{x^2+5x-20}{x^2-3x-18}$.

- a. $x = 1 \pm 2\sqrt{6}$
- b. $x = 1 \pm \sqrt{6}$
- c. $x = 1 \pm \sqrt{15}$
- d. $x = \frac{-5 \pm \sqrt{133}}{2}$
- e. None of the preceding

19. A gardener wants to enclose a circular garden with fencing materials. The fencing materials cost \$8.50 per foot. If the total area of the garden is A square feet, how much would it cost (in terms of A) to enclose the garden with fencing?

- a. $8.5\sqrt{A}$ dollars
- b. $\frac{17\sqrt{A}}{\pi}$ dollars
- c. $17\sqrt{A\pi}$ dollars
- d. $8.5\sqrt{A\pi}$ dollars
- e. None of the preceding

20. Let $f(x) = \begin{cases} -x^2 + 1 & \text{for } x \leq 0, \\ \left(\frac{1}{2}\right)^x & \text{for } x > 0. \end{cases}$

Which of the following statements is FALSE?

- a. f has exactly one zero.
 - b. The domain of f is $(-\infty, \infty)$.
 - c. f has a maximum value.
 - d. f is a strictly increasing function (it never decreases).
 - e. f has a horizontal asymptote.
21. The daily profit earned by the Weldon factory is related to the number of cases of candy canes produced in the following way: $P(x) = -x^2 + 160x - 3400$, where $P(x)$ is the daily profit in dollars and x is the number of cases of candy canes produced daily. Determine which of the following is/are true.
- I. If no candy canes are produced on a given day, the company has a loss of \$3400.
 - II. The number of cases of candy canes that must be produced daily to achieve a maximum profit is 160.
 - III. The maximum daily profit is \$3000.
- a. Only III is true
 - b. I and III are true
 - c. I and II are true
 - d. None are true
 - e. All are true

22. Suppose that f is a function that is defined for all real numbers. Which of the following conditions assures that f has an inverse function?

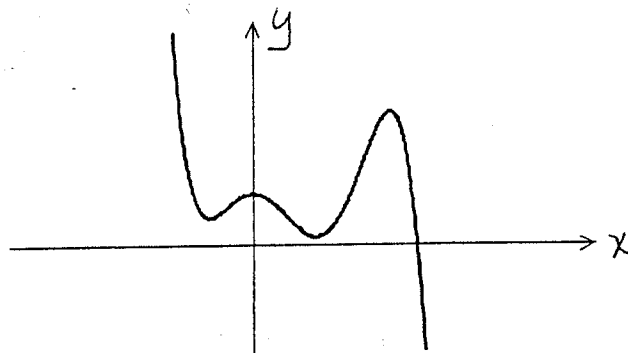
- a. The function f is symmetric with respect to the origin.
- b. The function f is a strictly increasing function.
- c. The function f is symmetric with respect to the y -axis.
- d. The graph of f is concave up on its entire domain.
- e. The function f is periodic.

23. Use the Rational Roots Theorem to determine the number of distinct possible rational roots of

$$p(x) = 3x^3 - 2x^2 - 27x + 18.$$

- a. There are 3 distinct possible rational roots.
- b. There are 8 distinct possible rational roots.
- c. There are 12 distinct possible rational roots.
- d. There are 16 distinct possible rational roots.
- e. There are 24 distinct possible rational roots.

24. Given the following graph of a polynomial function, what is the possible degree of this polynomial?



- a. 6
- b. 5
- c. 4
- d. 3
- e. 2

Name _____ Instructor _____ Section _____

Questions 25 – 28 are free response. Pages 9 through 11 should be turned in with your Answer Sheet. To receive credit, please show all correct work.

25. A police helicopter has spotted the car of a fugitive and is hovering directly above the car at an altitude of 1000 ft. The car begins to race up a long inclined road which has an angle of elevation of 15° . At the top of the road is a police barricade. From the helicopter, the angle of depression to the police barricade is 35° . How far does the car travel before it reaches the police barricade and the fugitive is caught? (10 points)

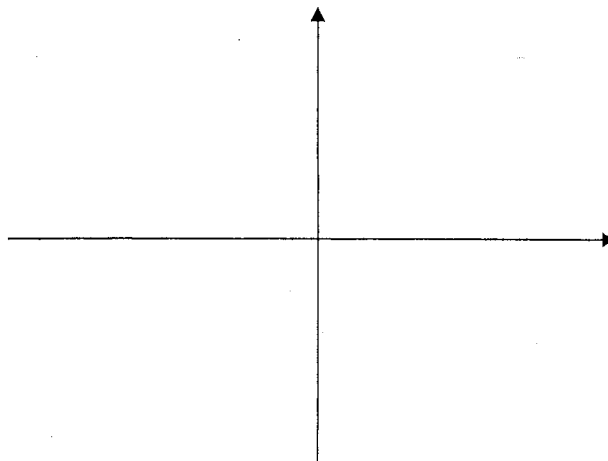
26. Solve for y: $2xy - 3 = ry + 8x$ (6 points)

27. Let $h(x) = \log_7(2x^2 + x - 6)$. (10 points)
- Evaluate $h(5)$.
 - Provide two functions, $f(x)$ and $g(x)$ such that $(f \circ g)(x) = h(x)$.
 - Find the zeros of $h(x)$.

28. Fill in the information requested in the associated table and graph the function neatly. To make your graphs fairly accurate, you may want to find a couple of points. (10 points each)

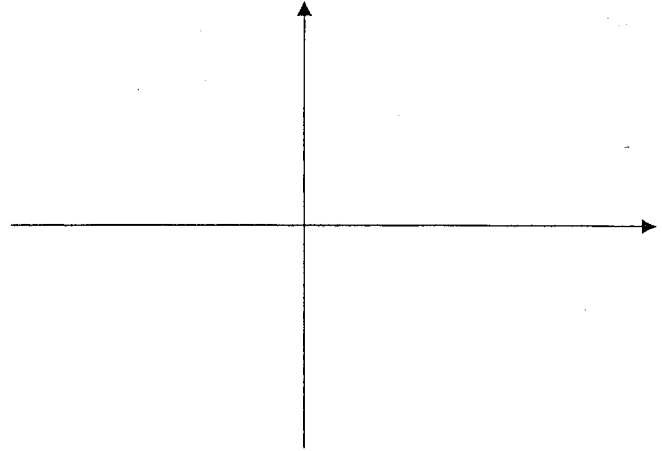
a. $f(x) = \log_3(x + 9)$

	Answers
Domain	
Range	
Asymptote(s)	
x-intercept(s)	
y-intercept	



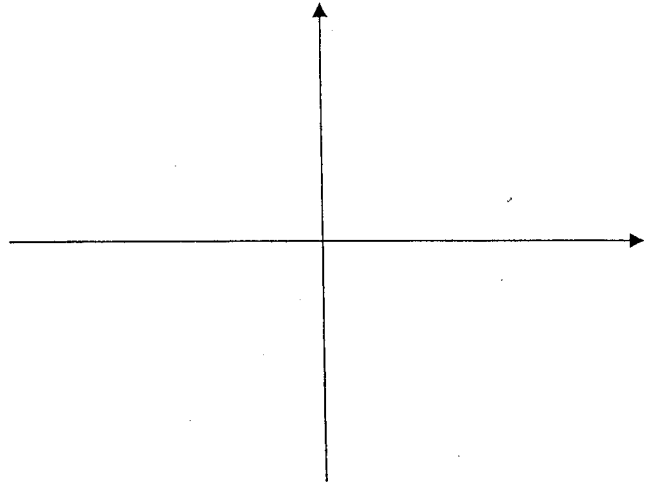
c. $f(x) = \frac{1}{(x-3)^2} + 1$

	Answers
Domain	
All asymptote(s)	
x-intercept(s)	
y-intercept	



d. $f(x) = 4 \sin(2x - \pi)$

	Answers
Domain	
range	
x-intercept(s) for one period	
y-intercept	



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