

The following 20 multiple choice questions are worth 5 points each.

1. Determine the equation of the line that passes through $(4,2)$ and is parallel to $-2x + y - 2 = 0$.

a. $y = \frac{1}{2}x - 10$

b. $y = 2x - 6$

c. $y = -2x - 10$

d. $y = 2x + 2$

e. $y = 2x - 10$

2. Determine $f(-1) + f(0)$ given

$$f(x) = \begin{cases} 5x - 3, & x < -1 \\ -4x + 1, & x \geq -1 \end{cases}$$

a. -3

b. -2

c. 0

d. -7

e. 6

3. Suppose $f(x) = 2x^2 - 5x + 8$. Determine $\frac{f(x+h) - f(x)}{h}$, $h \neq 0$.

a. 0

b. 1

c. $4x - 5h + 8$

d. $4x + 8h - 5$

e. $4x + 2h - 5$

4. Which of the following equations define y as a function of x .

I. $3x^2 + y = 7$

II. $2x + y^2 = 6$

III. $\ln x - y = 8$

IV. $y = \sin x$

a. All define functions

b. None define functions

c. I, II and IV only

d. I, III and IV only

e. I and IV only

5. Determine the domain of: $f(x) = \frac{\sqrt{x-2}}{x-5}$

a. $[2, \infty)$

b. $[2, 5) \cup (5, \infty)$

c. $(-\infty, 5) \cup (5, \infty)$

d. $(5, \infty)$

e. $[2, 5)$

6. 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. $x = 1 \pm \sqrt{14}$

7. Solve for x : $\frac{x}{5} - \frac{2}{3} < \frac{x}{3} + 3$

a. $\left(-\infty, -\frac{55}{2}\right)$

b. $\left(-\infty, \frac{55}{2}\right)$

c. $\left(-\frac{55}{2}, \infty\right)$

d. $\left(\frac{55}{2}, \infty\right)$

e. $(-\infty, \infty)$

8. 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?

a. $(-5, -5)$

b. $(-5, -7)$

c. $(-1, -5)$

d. $(-2.5, -7)$

e. $(-1, -4.5)$

9. 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 of its dimensions x , where one side x has the brick wall and the opposite side x has the fence.

a. $C(x) = 3600 - 6x$

b. $C(x) = \frac{3600}{x} + 48x$

c. $C(x) = 40y + 34x$

d. $C(x) = \frac{360}{x} + 34x$

e. $C(x) = \frac{7200}{x} + 34x$

10. Determine which of the following statements is/are true.

$$\text{Given } f(x) = -2(x+4)^2 + 8$$

- I. The vertex of the parabola represented by the function is $(-4, 8)$.
 - II. The range is $[8, \infty)$.
 - III. The x -intercepts are $x=6$, $x=2$.
- a. All are true d. Only I is true
b. I and III are true e. None are true
c. Only II is true

11. Let $f(x) = 2x + 3$ and $g(x) = \sin x$. Determine $(f \circ g)(x)$

- a. $(f \circ g)(x) = \sin(2x + 3)$
- b. $(f \circ g)(x) = 2\sin(x + 3)$
- c. $(f \circ g)(x) = \sin(2x) + 3$
- d. $(f \circ g)(x) = 2\sin(x) + 3$
- e. $(f \circ g)(x) = (2x + 3)\sin x$

12. Let $f(x) = (x+4)^2$ for $x \geq -4$. Determine $f^{-1}(x)$.

- a. $f^{-1}(x) = \sqrt{x+4}$
- b. $f^{-1}(x) = \sqrt{x} - 4$
- c. $f^{-1}(x) = \sqrt{x-4}$
- d. $f^{-1}(x) = \frac{1}{(x+4)^2}$
- e. $f^{-1}(x)$ does not exist

13. Given $f(x) = a(x-h)^2 + k$, where $a, h, k > 0$. Determine which of the following statements is/are true.

- I. The function has a maximum value.
- II. The function has no x -intercepts.
- III. The vertex is located in Quadrant II.
- IV. The y -intercept is $(0, ah^2 + k)$.

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

14. If we let $\ln x = t$, then $\ln\left(\frac{e^2}{x}\right)$ can be expressed as:

- a. $2-t$
- b. $2t$
- c. $\frac{2}{t}$
- d. $t-2$
- e. $2t-1$

15. A bird species in danger of extinction has a population that is decreasing exponentially and is modeled by $A = 1400e^{-.06729t}$. Once the population drops below 100, the situation will become irreversible. When will this happen? [Round your answer "up" to the nearest whole year.]

- a. 34 years
- b. 36 years
- c. 38 years
- d. 40 years
- e. 42 years

16. The Delaware-Pennsylvania border is an arc on a circle of radius 12 miles intercepted by a central angle of $\theta = 110^\circ$. Determine the arc-length. Round your answer to the nearest mile.

- a. 1320 miles
- b. 9 miles
- c. 23 miles
- d. 12 miles
- e. 420 miles

17. Given the following trigonometric function, determine which of the following statements is/are true.

$$y = 5 \sin\left(\frac{1}{2}x + \frac{\pi}{12}\right) + 2$$

- I. The amplitude is 7 units.
- II. The graph is vertically shifted 2 units.
- III. The period is 4π .
- IV. The phase shift is $\frac{\pi}{6}$ units to the right.

- a. All are true
- b. I, II and III are true
- c. II and III are true
- d. II, III and IV are true
- e. II and IV are true

18. Determine the exact value of $\sec\theta$ given that $\tan\theta = -\frac{1}{3}$ and $\sin\theta < 0$.

- a. $\sec\theta = \frac{3\sqrt{10}}{10}$
- b. $\sec\theta = \frac{\sqrt{10}}{3}$
- c. $\sec\theta = \frac{-3\sqrt{10}}{10}$
- d. $\sec\theta = \frac{\sqrt{10}}{3}$
- e. $\sec\theta$ cannot be determined

19. Determine the exact value of $\cos 15^\circ$.

a. 0.4330

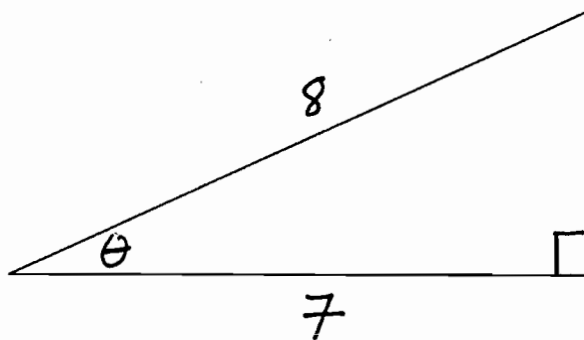
b. $\frac{\sqrt{6}-\sqrt{2}}{2}$

c. $\frac{\sqrt{6}+\sqrt{2}}{2}$

d. $\frac{\sqrt{6}+\sqrt{2}}{4}$

e. $\frac{\sqrt{6}-\sqrt{2}}{4}$

20. Use the triangle below to determine the exact value of $\sin 2\theta$.



a. $\frac{17}{32}$

b. $\frac{7\sqrt{15}}{64}$

c. $\frac{7+\sqrt{15}}{64}$

d. $\frac{7}{32}$

e. $\frac{7\sqrt{15}}{32}$

Name _____

Instructor _____

Section _____

Pages 8 and 9 should be submitted with your Scan Sheet.

21. For each of the following functions, determine the requested information. All answers should be exact. Use Interval Notation for the domain and range. Put "none" for any characteristic that does not exist. [36 points]

a. $f(x) = \frac{4x-12}{x+3}$

Domain _____ Range _____

Equation of Asymptotes _____

x-intercept _____ y-intercept _____

b. $g(x) = \log_4(x+2) - 1$

Domain _____ Range _____

Equation of Asymptote _____

x-intercept _____ y-intercept _____

c. $h(x) = 2^{x-4} - 8$

Domain _____ Range _____

Equation of Asymptote _____

x-intercept _____

d. $k(x) = 3\sin\left(x - \frac{\pi}{6}\right) + 5$

Domain _____ Range _____

Phase Shift _____

Show all work for full credit!

22. An eagle perched on a 100 foot pine tree, spies a small mouse across Lake Yellowstone. The angle of depression from the eagle to the mouse across the lake is 28° from the horizontal. How far did the eagle fly to cross the lake and land on the ground to capture the mouse? [6 points]

23. Verify the following identity. Show all work for full credit. [8 points]

$$\frac{\sin x}{1+\cos x} + \frac{\cos x}{\sin x} = \csc x$$

Multiple Choice Key
M115 09S – Final Exam

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