

The following 15 multiple choice questions are worth 5 points each.

1. Let  $f(x) = \frac{ax-b}{x}$ , where  $a > 0$  and  $b > 0$ . Which of the following is/are true?

I. The graph of  $f$  has one  $y$ -intercept at  $(0, -b)$ .

II. The graph of  $f$  has no vertical asymptotes.

III. The graph of  $f$  has one  $x$ -intercept at  $\left(\frac{b}{a}, 0\right)$ .

a. Only I and III are true

c. Only I and II are true

b. Only III is true

d. Only II is true

e. None are true

2. Determine which of the following is equivalent to:  $\frac{(x+1)^3(2x) - (x-1)(3)(x+1)^2}{(x+1)^4}$

a.  $\frac{-x+3}{(x+1)}$

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

b.  $\frac{-x+3}{(x+1)^2}$

d.  $\frac{-3x^2 + 2x + 3}{(x+1)^2}$

e.  $\frac{2x^2 - x + 3}{(x+1)}$

3. Let  $f(x) = \sqrt{x}$ . Compute the difference quotient:  $\frac{f(4+h) - f(4)}{h}$

(Write the answer so that it does not contain radical expressions in the numerator.)

a.  $\frac{1}{\sqrt{4+h} + 2}$

b.  $\frac{2}{\sqrt{4+h}}$

c.  $\frac{2+h}{h\sqrt{4+h}}$

d.  $\frac{1}{\sqrt{h} + 4}$

e.  $\frac{4+h}{h\sqrt{4+h} + 2}$

4. Find  $A$  and  $B$  such that  $\frac{8x+5}{(x+2)^2} = \frac{A}{x+2} + \frac{B}{(x+2)^2}$

The value of  $B$  is:

- a. -11
  - b. -1
  - c. -10
  - d. 3
  - e. 5
5. Solve the following system of equations:

$$\begin{cases} x^2 + y^2 = 4 \\ x + y = 4 \end{cases}$$

The  $y$ -coordinate of the solution is:

- a. 2
  - b. 8
  - c. 16
  - d. 4
  - e. This system has no solution.
6. Which of the following are true about the function  $f(x) = 3^{x+6} - 9$ ?
- I. It has a  $y$ -intercept.
  - II. It has an asymptote of  $y = -9$ .
  - III. Its domain is  $(-\infty, \infty)$  with range  $(-9, \infty)$ .
  - IV. It has an asymptote of  $x = -3$ .
- a. Only I, II and III are true.
  - b. Only I, II and IV are true.
  - c. Only I, III and IV are true.
  - d. Only II, III and IV are true.
  - e. All are true.

7. Rewrite the following logarithm.  
No logarithms of products, quotients, powers or radicals should appear.

$$\log_b \frac{x\sqrt{y}}{(2x+y)^2}$$

- a.  $\log_b x + \frac{1}{2}\log_b y - 2\log_b 2x - 2\log_b y$
- b.  $2\log_b x + \log_b y - 2\log_b (2x + y)$
- c.  $\frac{1}{2}(\log_b + \log_b y) - 2(\log_b 2x + \log_b y)$
- d.  $\log_b x + \frac{1}{2}\log_b y - 2\log_b (2x + y)$
- e.  $2\log_b x + \log_b y - 4(\log_b 2x + \log_b y)$
8. Which of the following is/are true about the function  $f(x) = \log_6(x+6)$  ?
- a. It has a asymptote of  $x = -6$
- b. Its range is  $(-\infty, \infty)$
- c. Its  $y$ -intercept is 1
- d. Its  $x$ -intercept is  $-5$
- e. All are true
9. Solve:  $\log_2(x+1) = 3 - \log_2(2x+1)$
- a.  $x = \frac{-3 + \sqrt{65}}{4}$
- b.  $x = -\frac{7}{15}$
- c.  $x = \frac{1}{3}$
- d.  $x = \frac{-1 + \sqrt{73}}{2}$
- e.  $x = \frac{-3 + \sqrt{17}}{4}$

10. Find the inverse function of  $f(x) = 3e^{(5x-4)}$

a.  $f^{-1}(x) = \frac{4 + \frac{\ln x}{3}}{5}$

b.  $f^{-1}(x) = \frac{\ln\left(\frac{x}{3} + 4\right)}{5}$

c.  $f^{-1}(x) = \frac{\ln\frac{x}{3} + \ln 4}{5}$

d.  $f^{-1}(x) = \frac{4 + \ln x}{15}$

e.  $f^{-1}(x) = \frac{4 + \ln\frac{x}{3}}{5}$

11. Determine the area of a sector if its central angle is  $\frac{\pi}{3}$  and its arc length is  $5\pi$  inches.

a.  $\frac{75\pi}{2}$

b.  $\frac{5\pi^2}{18}$

c.  $75\pi$

d.  $\frac{25\pi}{18}$

e.  $\frac{5\pi^2}{3}$

12. Determine the measure of  $\theta$  to the nearest degree.

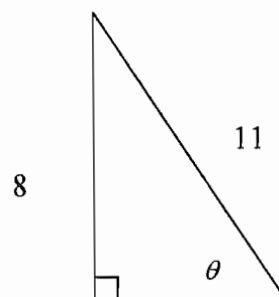
a.  $81^\circ$

b.  $62^\circ$

c.  $47^\circ$

d.  $43^\circ$

e.  $79^\circ$



13. Let  $\theta = \frac{7\pi}{6}$ . Which of the following is/are true?

I. The reference angle  $\theta' = \frac{\pi}{6}$

II.  $\cos\theta = \frac{\sqrt{3}}{2}$

III.  $\csc\theta = -2$

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

14. If  $\tan\theta = 3$  and  $\cos\theta < 0$ , find  $\sin\theta$ .

a.  $\sin\theta = \frac{1}{\sqrt{10}}$

b.  $\sin\theta = -\frac{1}{\sqrt{3}}$

c.  $\sin\theta = \frac{1}{\sqrt{3}}$

d.  $\sin\theta = -\frac{1}{\sqrt{10}}$

e.  $\sin\theta = -\frac{3}{\sqrt{10}}$

15. A forest ranger is stationed in a tower 45 meters above the ground. She spots a fire at an angle of depression of  $6^\circ$ . How far is the forest fire from the base of the ranger tower?

- a. 372 meters
- b. 293 meters
- c. 452 meters
- d. 428 meters
- e. 347 meters

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

Questions 16 - 18 are free response. Pages 6 and 7 should be turned in with your Answer Sheet.  
To receive credit please show all (correct) work.

16. Graph the function  $f(x) = \frac{2x^2 + 14x - 120}{x^2 - 7x - 30} = \frac{2(x-5)(x+12)}{(x+3)(x-10)}$ .

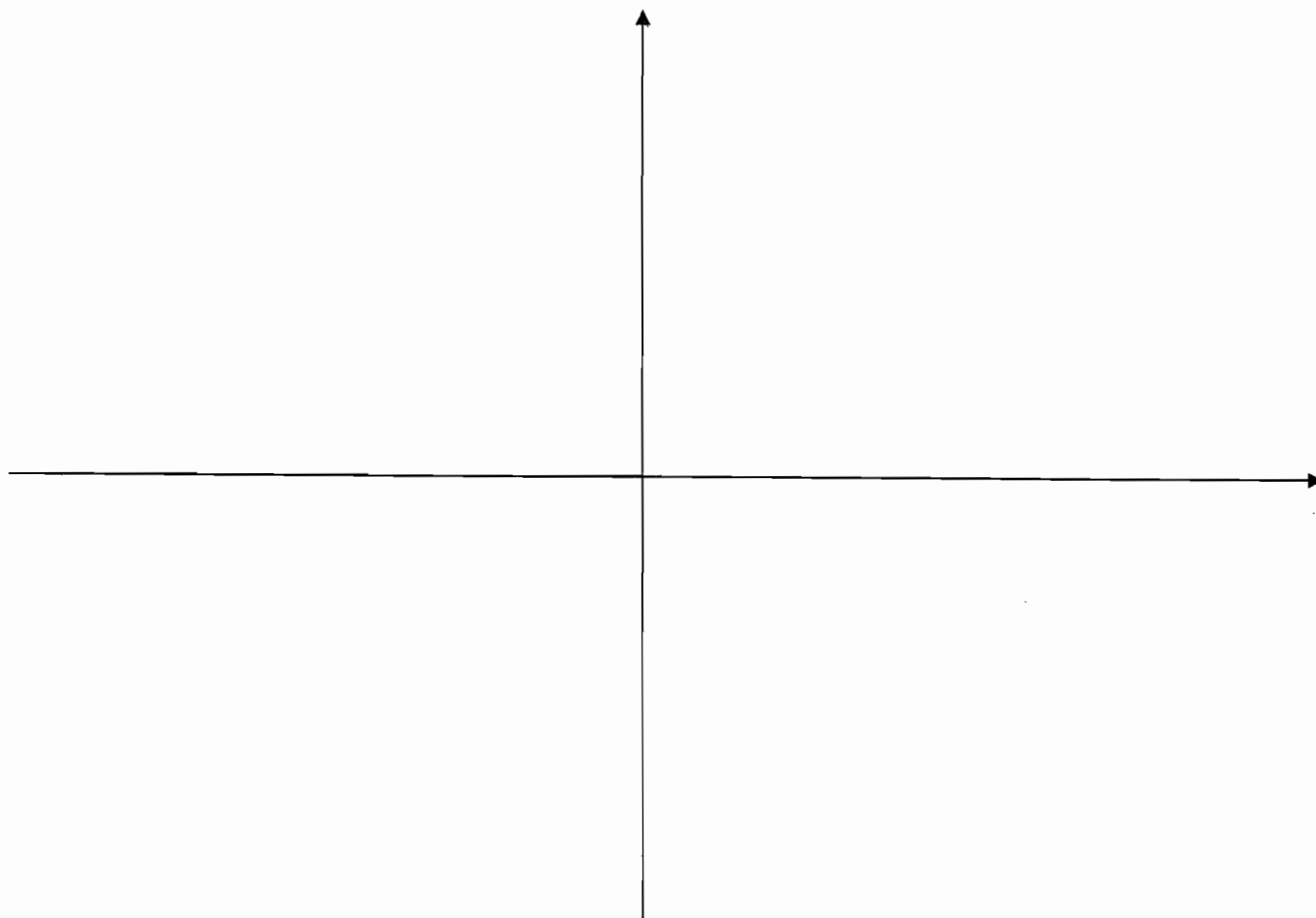
Determine each of the following:

x-intercept(s) \_\_\_\_\_

y-intercept \_\_\_\_\_

Vertical asymptote(s) \_\_\_\_\_

Horizontal asymptote \_\_\_\_\_



17. The **half-life** of radioactive lead-210 is 21.7 years.  
Find the decay constant (the rate of decay), correct to four decimal places.

18. Let  $y = 3 \sin\left(2x + \frac{\pi}{2}\right)$ . Determine each of the following.

\_\_\_\_\_ amplitude

\_\_\_\_\_ frequency

\_\_\_\_\_ period

\_\_\_\_\_ phase shift

Determine the guidepoints, showing how you found them.

Then graph the function for one complete cycle.

