

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

1. Consider the logarithmic function  $f(x) = -\log_b(x+3)$ . Determine which of the following is/are true about the graph of  $f$ .

- I. The domain is  $(-3, \infty)$ .
- II. The range is  $(-\infty, \infty)$ .
- III. The asymptote is  $x = -3$ .
- IV. The  $x$ -intercept is  $(-2, 0)$ .
- V. The  $y$ -intercept is  $(0, -\log_b 3)$ .

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

2. Let  $\log_b 3 = C$  and  $\log_b 5 = D$ . Write the following expression in terms of ~~C~~ and ~~D~~. C   D

$$\log_b \frac{b}{125} + \log_b 135$$

- a.  $1 - 4D + 3C$
- b.  $1 - 3D + 3DC$
- c.  $1 - 2D + 3C$
- d.  $3C - 4D$
- e. None of the preceding.

3. Evaluate  $\log_\pi 27$ .

- a. 0.9
- b. 0.7
- c. 2.9
- d. 8.6
- e. 0.3

4. Rewrite as a single logarithm  $4\ln x - 2\ln y - \frac{1}{2}\ln(z+1)$ .

a.  $\ln \frac{4x}{y^2 - \sqrt{z+1}}$

c.  $\ln \frac{4x}{-y^2\sqrt{z+1}}$

b.  $\ln(4x - 2y - \frac{1}{2}(z+1))$

d.  $\ln \frac{x^2}{y^2 - z - 1}$

e.  $\ln \frac{x^4}{y^2\sqrt{z+1}}$

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

I.  $\log(x+5) + \log(3x) = \log(x+5) \cdot \log(3x)$

II.  $\ln \sqrt{2} = \frac{\ln 2}{2}$

III.  $x(\log 10^x) = x^2$

a. Only II and III are true.

c. Only I and III are true

b. Only I and II are true

d. All are true.

e. None are true.

6. Solve:  $\log(8-x) - \log(3-x) = \log 2$

a.  $x = -2$

b.  $x = 2$

c.  $x = -1$

d.  $x = \frac{3}{2}$

e. No solution

7. Solve:  $3e^{3x+2} = 18$

a.  $x = \frac{\ln 18 - 2}{3}$

b.  $x = \ln 2 - \frac{2}{3}$

c.  $x = \frac{\ln 4}{3}$

d.  $x = \frac{\ln 18}{\ln 3} - \frac{2}{3}$

e.  $x = \frac{\ln 6 - 2}{3}$

8. A laboratory is performing an experiment with bacteria growth. Three samples have the following growth models, where  $A$  is the number of bacteria present after  $t$  hours.

Sample  $X$ :  $A = 140e^{0.37t}$

Sample  $Y$ :  $A = 160e^{0.25t}$

Sample  $Z$ :  $A = 121e^{0.19t}$

Determine which of the following are true.

- I. Sample  $X$  has the fastest growth rate.
- II. When the experiment began, Sample  $Y$  had 160 bacteria.
- III. It will take about 5 hours for the bacteria in Sample  $Z$  to double.

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

9. The following logistic growth function models the number of people,  $f(t)$ , in a city who have become ill with influenza  $t$  weeks after its initial outbreak.

$$f(t) = \frac{500,000}{1 + 2499e^{-0.92t}}$$

How many people were ill by the end of the 8<sup>th</sup> week?

- 500,002
  - 193,061
  - 63
  - 200
  - 314,367
10. Determine which of the following is/are true.

I.  $315^\circ$  is equivalent to  $\frac{7\pi}{4}$ .

II.  $\frac{4\pi}{3}$  is in the 2<sup>nd</sup> quadrant.

III.  $-\frac{13\pi}{4}$  is coterminal with  $\frac{3\pi}{4}$ .

- Only I and II are true.
- Only II and III are true.
- Only I is true.
- Only I and III are true.
- All are true.

11. Let  $P\left(\frac{\sqrt{65}}{9}, \frac{4}{9}\right)$  be a point on the unit circle corresponding to the real number  $t$ , where  $0 < t < \frac{\pi}{2}$ . Determine which of the following is/are true.

I.  $\cos t = \frac{\sqrt{65}}{9}$

II.  $\csc t = \frac{9}{4}$

III.  $\tan t = \frac{\sqrt{65}}{4}$

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

12. If  $\sin t = -\frac{3}{4}$ , and  $\pi < t < \frac{3\pi}{2}$ , determine  $\cos t$ .

a.  $\cos t = -\frac{1}{2}$

c.  $\cos t = -\frac{\sqrt{7}}{4}$

b.  $\cos t = -\frac{1}{4}$

d.  $\cos t = \frac{7}{4}$

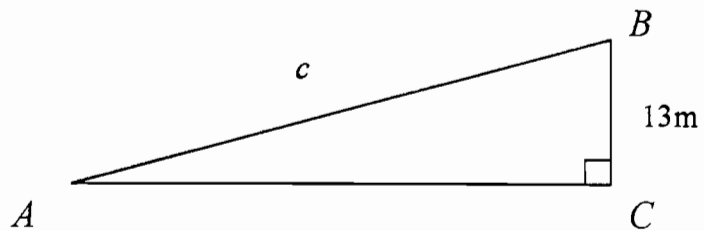
e.  $\cos t = \frac{1}{4}$

13. In the triangle to the right,  $\angle A = 17^\circ$ .

Determine the length of side  $c$ .

Round one decimal.

- a. 24.4m
- b. 42.5m
- c. 13.6m
- d. 33.3m
- e. 44.5m



14. A flagpole is situated on top of a building. The angle of elevation from a point on level ground 200 feet from the building to the top of the flagpole is  $27^\circ$ . The angle of elevation from the same point to the bottom of the flagpole is  $23^\circ$ . Find the height of the flagpole to the nearest tenth of a foot.
- a. 19.2 feet
  - b. 17.0 feet
  - c. 21.0 feet
  - d. 14.8 feet
  - e. 15.9 feet

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

Questions 15-19 are free response and are worth 6 points each.  
Pages 7 and 8 should be turned in with your answer sheet.

**To receive credit please show all correct work.**

15. Expand the following logarithmic expression as much as possible. (No logs of products, quotients or powers should appear.)

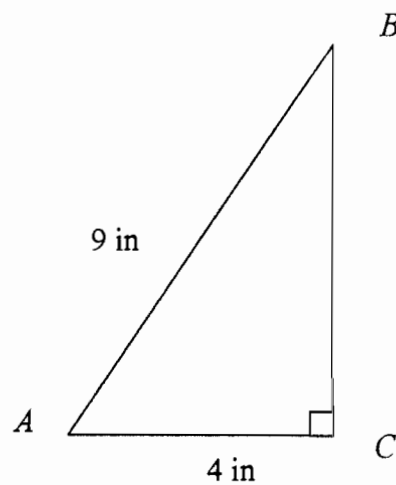
$$\log_b \frac{y^2 \sqrt{z^2 + 2}}{(x+1)^3}$$

16. Solve:  $e^{2x} - 3e^x - 4 = 0$  (Express your answer in terms of the natural logarithm.)

17. In 1984 25,000 cell phones were sold in the U.S. In 2003 70,500,000 cell phones were sold in the U.S.  
Use the exponential growth model,  $A = A_0e^{kt}$ , to find the growth rate,  $k$ , of cell phone sales.  
Round  $k$  to 4 decimal places.

18. Find the length of the arc on a circle of radius 10 feet intercepted by a  $225^\circ$  angle. Express the arc length in terms of  $\pi$ .

19. In the triangle to the right determine the measure of  $\angle B$  to the nearest tenth of a degree.



M115 08F – Exam 3

Multiple Choice Key – White

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