

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

1. If \$5000 is invested in a savings account in 2009 that pays 4% annual interest, compounded monthly, how much will be in the account in

2029? Use $A = P \left(1 + \frac{r}{n} \right)^{nt}$

- a. \$11,112.91
 - b. \$10,955.62
 - c. \$61,231,011.82
 - d. \$5344.10
 - e. \$5203.50
2. A laboratory is performing an experiment with bacteria growth. Three samples have the following growth models, where A is the number of bacteria (in thousands) present after t-hours.

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

Sample Y: $A = 140e^{0.18t}$

Sample Z: $A = 120e^{0.45t}$

Determine which of the following is/are true.

- I. Sample X has the fastest growth rate.
 - II. Sample Y had 140 (thousand) bacteria when the experiment began.
 - III. It will take about 1.54 hours ~~for~~^{to} the bacteria in sample Z to double.
- a. All are true
 - b. I and II are true
 - c. II and III are true
 - d. I and III are true
 - e. None are true

3. Given the following logarithmic function, determine which of the following is/are true about its graph.

$$f(x) = \log_3(x+4) - 2$$

- I. The domain is $(4, \infty)$.
 - II. The point $(1, 0)$ is translated to $(-3, -2)$.
 - III. The x -intercept is $(5, 0)$.
 - IV. The asymptote is $x = -4$.
- a. None are true
 - b. All are true
 - c. I, II and III are true
 - d. II and IV are true
 - e. II, III and IV are true

4. Evaluate $\log_x 100$. [Correct to two decimal places]

- a. 0.64
- b. 4.02
- c. 1.50
- d. 2.0
- e. 4.73

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

$$\log_b 48 + \log_b \frac{b}{27}$$

- a. $5AC - 3C + 1$
- b. $4A - 3C$
- c. $8AC + 1$
- d. $4A - 2C + 1$
- e. None of the preceding

6. The logistic growth function models the number of people, $N(t)$, in Mexico City who have become ill with the NIHI (swine) flu, t -weeks after it's initial outbreak.

$$N(t) = \frac{500,000}{1 + 2799e^{-0.92t}}$$

How many people does the model predict will be ill by the end of the third week? [Correct to the nearest person]

- a. 500,000
b. 179
c. 2822
d. 2807
e. 282

7. Rewrite the following expression as a single logarithm.

$$\frac{1}{2}\ln x - 4\ln y - \ln(z+3)$$

- a. $\ln \frac{\frac{1}{2}x}{4y - z - 3}$
b. $\ln \frac{\sqrt{x}}{y^4 - z - 3}$
c. $\ln \left(\frac{1}{2}x - 4y - z - 3 \right)$
d. $\ln \frac{\sqrt{x}}{-y^4(z+3)}$
e. $\ln \frac{\sqrt{x}}{y^4(z+3)}$

8. Solve the following exponential equation.

$$5e^{2-3x} = 325$$

a. $x = \frac{1 - \ln 300}{3}$

d. $x = -21$

b. $x = \frac{2 - \ln 65}{3}$

e. $x = \ln(-21)$

c. $x = \frac{\ln 65 - 2}{3}$

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

I. $\ln e = 0$

II. The equivalent logarithmic form of $a^2 = x$ is $\log_a 2 = x$.

III. $\frac{\log_2 8}{\log_2 4} = \log_4 8$

IV. $\log(-10) = -1$

a. All are true

d. Only III is true

b. None are true

e. III and IV are true

c. II, III and IV are true

10. Solve: $\log_6 x - \log_6(x-9) = 2$.

a. $x = 12$ and $x = -3$

b. $x = 12$ and $x = 3$

c. $x = 12$ only

d. $x = -3$ only

e. No solution

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

I. 390° is equivalent to $\frac{13\pi}{6}$.

II. $\frac{22\pi}{3}$ is located in the 2nd quadrant.

III. $\frac{-13\pi}{4}$ is co-terminal with $\frac{5\pi}{4}$

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

12. Determine the approximate length of the arc on a circle of radius 12.5 inches intercepted by a central angle of $\theta = 135^\circ$. [Correct to one decimal place]

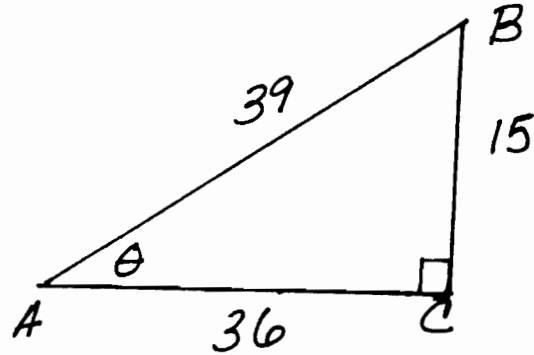
- a. 30.1 inches
- b. 29.9 inches
- c. 29.7 inches
- d. 29.5 inches
- e. 29.3 inches

13. Given the right triangle below determine which of the following is/are true.

I. $\csc \theta = \frac{39}{15}$

II. $\tan \theta = \frac{36}{15}$

III. $m(\angle \theta) \approx 25^\circ$



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

14. Determine the length of side x as indicated in the right triangle below.

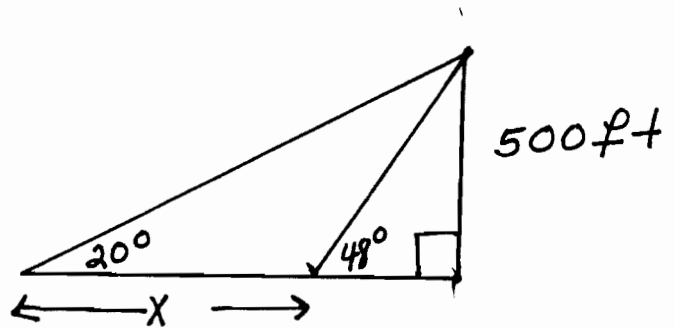
a. $x = 923.5$ ft.

b. $x = 373.3$ ft.

c. $x = 754.8$ ft.

d. $x = 1373.7$ ft.

e. The value cannot be determined.



Name _____ Instructor _____

Section _____

Questions 15-18 are free response. Pages 7 - 8 should be turned in with your answer sheet.

15. Expand the following logarithmic expression as much as possible. [No logs of products, quotients, or powers should appear.] [6 points]

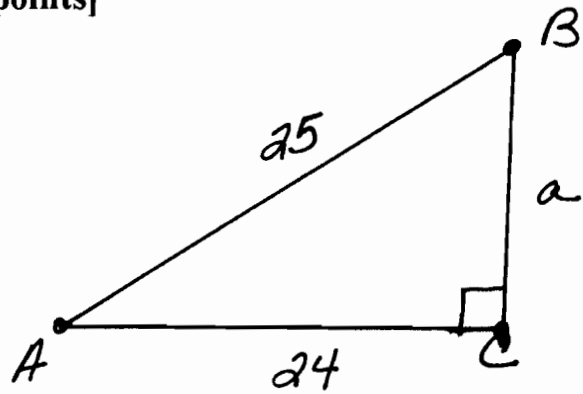
$$\log_b \frac{z^4 \sqrt{y^2 + 8}}{(x+5)^3}$$

16. If 25 grams of radioactive waste reduces to 20 grams in 6000 years, determine the half-life of this radioactive element.
- a. Your initial step is to determine the value of k and the decay model. Use the formula, $A = A_0 e^{kt}$ [k-correct to 7 decimal places] [6 points]

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- b. Determine the half-life. _____ [4 points]
[t-correct to the nearest year]

17. A police helicopter is flying at a height of 800 feet above the ground. A stolen car is sighted at an angle of depression of 68° . Determine the distance of the stolen car, to the nearest foot, from a point directly below the helicopter. [Correct to the nearest foot - 8 points]

18. Given the following triangle, determine the length of side a and the measures of angles A and B . [All computations should be correct to one decimal place. [6 points]



- a. Length of side a . _____
- b. Measure of $\angle A$. _____
- c. Measure of $\angle B$. _____

Multiple Choice Key
M115 09S – Exam 3

1. A
2. C
3. E
4. B
5. D
6. D
7. E
8. B
9. D
10. All answers correct
11. B
12. D
13. C
14. A