

MAC 1147 TEST IIIA  
SPRING 2009

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- A. Sign your scantron sheet in the white area on the back in ink.
- B. Write and code in the spaces indicated:
- 1) Name (last name, first initial, middle initial)
  - 2) UF ID number
  - 3) Discussion section number
- C. Under "special codes" code in the test ID numbers 3, 1.
- |   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | • | 4 | 5 | 6 | 7 | 8 | 9 | 0 |
| • | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 0 |
- D. At the top right of your answer sheet, for "Test Form Code" encode A.
- B C D E
- E. While taking the test, please keep your answer sheet covered or turned over at all times.
- F. This test consists of 6 three-point multiple choice questions, 8 five-point multiple choice questions and four pages of partial credit questions worth 25 points. The time allowed is 90 minutes.
- G. WHEN YOU ARE FINISHED:
- 1) Before turning in your test check for transcribing errors. Any mistakes you leave in are there to stay.
  - 2) You must turn in your scantron and tear off sheets to your discussion leader. Be prepared to show your picture I.D. with a legible signature.
  - 3) The answers will be posted after the exam on the web [www.math.ufl.edu/~huang/MAC1147.html](http://www.math.ufl.edu/~huang/MAC1147.html).

**NOTE:** Be sure to bubble the answers to questions 1-14 on your scantron.

**Part I: 3 points each**

1. Which of the following functions has a horizontal asymptote  $y = -1$ ?

a.  $y = 3^{x+1} - 1$

b.  $y = 3^{-x+1} + 1$

c.  $y = \log_3(x - 1) - 1$

d.  $y = \log_3(x + 1) + 1$

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2. Which of the following points is not on the graph of  $y = \log_{\frac{1}{2}}(x + 1)$ ?

a.  $(0, 0)$

b.  $\left(-\frac{1}{2}, 1\right)$

c.  $(1, -1)$

d.  $(3, 2)$

---

3. Evaluate:  $10^{-\frac{1}{4} \log 16} =$

a.  $-4$

b.  $\frac{1}{2}$

c.  $2$

d.  $4$

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4. Which of the following has the same value as  $\sin\left(\frac{\pi}{6}\right)$ ?

a.  $\sin\left(-\frac{\pi}{6}\right)$

b.  $\sin\left(\frac{7\pi}{6}\right)$

c.  $\sin\left(-\frac{7\pi}{6}\right)$

d.  $\sin\left(\frac{11\pi}{6}\right)$

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5. Given  $\theta = 135^\circ$ , which of the following is not correct?

a.  $\theta = \frac{3\pi}{4}$

b.  $\tan \theta = 1$

c.  $\theta$  is in quadrant II.

d. The supplement of  $\theta$  is  $\frac{\pi}{4}$ .

6. (Bonus!) Which of the following is correct about the system

$$\begin{cases} x + y = 2 \\ \frac{1}{2}y = 5 - \frac{1}{2}x \end{cases} ?$$

- a. The system is inconsistent.
- b. The system is consistent.
- c. The system has infinitely many solutions.
- d. The system has exactly one solution.

**Part II: 5 points each**

7. Solve:  $\begin{cases} x^2 + y^2 = 25 \\ x + 3y = 5 \end{cases}$

- a. (0, 5) and (5, 0)
- b. (3, -4) and (0, 5)
- c. (-3, -4) and (0, 5)
- d. (-4, -3) and (5, 0)
- e. (-4, 3) and (5, 0)

8. How many angles below is/are coterminal with  $400^\circ$ ?

$-760^\circ$        $-320^\circ$        $-40^\circ$        $40^\circ$        $700^\circ$

- a. 1
- b. 2
- c. 3
- d. 4
- e. 5

9. A car is moving 30 miles per hour. The diameter of its wheel is 5 ft. Find the number of revolutions per minute of the rotating wheels. (1 mile = 5280 ft)

- a.  $\frac{264}{\pi}$  rpm
- b.  $\frac{440}{\pi}$  rpm
- c.  $\frac{528}{\pi}$  rpm
- d.  $\frac{2640}{\pi}$  rpm
- e.  $\frac{10}{\pi}$  rpm

10. Which of the following is/are true?

P.  $\tan\left(-\frac{\pi}{4}\right) = -\tan\left(\frac{\pi}{4}\right)$

Q.  $\cos\left(\frac{\pi}{3}\right) = \sin\left(\frac{5\pi}{6}\right)$

R.  $\cos\left(-\frac{\pi}{3}\right) = \cos\left(-\frac{4\pi}{3}\right)$

a. P only

b. Q only

c. R only

d. P and Q only

e. P and R only

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11. Solve:  $\log_{12}(x) + \log_{12}(x - 4) = 1$

a.  $x = 8$  only

b.  $x = \frac{5}{2}$  only

c.  $x = -2, 6$  only

d.  $x = -2$  only

e.  $x = 6$  only

---

12. Which of the following is/are equal to 2?

P.  $\log_{\sqrt{2}} 2$

Q.  $\frac{\log 10}{\log 5}$

R.  $\frac{1}{3 \ln \sqrt[6]{e}}$

a. P only

b. Q only

c. R only

d. P and R only

e. P, Q and R only

13. At a university with 40,000 students, a survey shows that the number of students  $N$  who have heard a piece of information after  $m$  months is given by the formula  $m = 33 - 6 \log(40,000 - N)$ . How many students will learn about the new bus service after 9 months?

- a. 10,000 students      b. 20,000 students      c. 25,000 students  
d. 30,000 students      e. close to 40,000 students
- 

14. Find the number of years required for \$2500 investment to triple at a rate of 12% compounded monthly.

- a.  $\frac{\ln(3)}{12 \ln(1.01)}$  years      b.  $\frac{\ln(3)}{\ln(1.12)}$  years      c.  $\frac{\ln(7500)}{1.12 \ln(2500)}$  years  
d.  $\frac{\ln(3)}{\ln(1.01)}$  years      e.  $\frac{\ln(3)}{12 \ln(1.12)}$  years



MAC 1147 TEST IIIA PART II  
SPRING 2009

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Sect # \_\_\_\_\_ Name \_\_\_\_\_

UF ID \_\_\_\_\_ Signature \_\_\_\_\_

SHOW ALL WORK TO RECEIVE FULL CREDIT.

1. A boat on a river travels downstream between two points, 20 miles apart, in one hour. The return trip against the current takes  $2\frac{1}{2}$  hours. Assume the speed of the boat and the speed of the current remain constant. If  $x$  is the speed of the boat (mi/hr) and  $y$  is the speed of the current (mi/hr), use a system of equations to solve for  $x$  and  $y$ .

$x =$  \_\_\_\_\_,  $y =$  \_\_\_\_\_

2. The number,  $N$ , of bacteria in a culture grows exponentially. In the beginning, the number of bacteria is 100. Two hours later, the number of bacteria is 300.

a) Find the model describing the number of bacteria.

$$N = \underline{\hspace{10em}}$$

b) Find the number of bacteria 4 hours later.

$$N = \underline{\hspace{10em}}$$

c) Find the time when the number of bacteria reaches 500. (leave  $\ln$  in your answer)

$$t = \underline{\hspace{10em}}$$

3. Given the function  $f(x) = 1 - \log_3(x - 1)$ .

a) Find the following:

1) domain of  $f$  \_\_\_\_\_

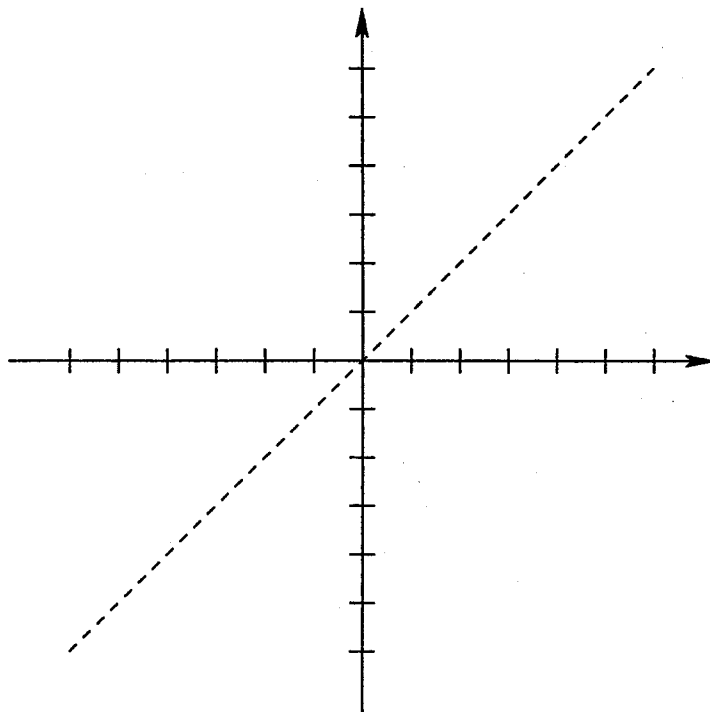
2) equation of the vertical asymptote \_\_\_\_\_

3)  $x$ -intercept(s):  $x =$  \_\_\_\_\_

b) Find  $f^{-1}(x)$ .

$f^{-1}(x) =$  \_\_\_\_\_

c) Sketch the graphs of  $y = f(x)$  and  $y = f^{-1}(x)$ .



4. Evaluate:

a)  $2 \cos\left(-\frac{\pi}{3}\right) + \sin\left(\frac{4\pi}{3}\right) - \tan\left(-\frac{9\pi}{4}\right)$

b)  $\sin\left(\frac{\pi}{2}\right) + \tan\left(-\frac{\pi}{2}\right) - \cos(\pi)$

MAC 1147 TEST IIIB  
SPRING 2009

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- D. At the top right of your answer sheet, for "Test Form Code" encode B.
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**NOTE:** Be sure to bubble the answers to questions 1-14 on your scantron.

**Part I: 3 points each**

1. Evaluate:  $10^{-\frac{1}{3} \log 27} =$

- a.  $-3$                       b.  $-\frac{1}{3}$                       c.  $\frac{1}{3}$                       d.  $3$
- 

2. Which of the following functions has a vertical asymptote  $x = -1$ ?

- a.  $y = \log_3(x - 1) - 1$                       b.  $y = \log_3(x + 1) + 1$   
c.  $y = 3^{x+1} - 1$                       d.  $y = 3^{-x+1} + 1$
- 

3. Which of the following points is not on the graph of  $y = \log_{\frac{1}{3}}(x + 1)$ ?

- a.  $(0, 0)$                       b.  $\left(-\frac{2}{3}, 1\right)$                       c.  $(8, 2)$                       d.  $(2, -1)$
- 

4. Given  $\theta = 135^\circ$ , which of the following is not correct?

- a.  $\theta = \frac{3\pi}{4}$                       b.  $\tan \theta = -1$   
c.  $\theta$  is in quadrant II.                      d. The complement of  $\theta$  is  $\frac{\pi}{4}$ .
- 

5. Which of the following has the same value as  $\cos\left(\frac{\pi}{3}\right)$ ?

- a.  $\cos\left(-\frac{5\pi}{3}\right)$                       b.  $\cos\left(\frac{2\pi}{3}\right)$                       c.  $\cos\left(-\frac{2\pi}{3}\right)$                       d.  $\cos\left(\frac{4\pi}{3}\right)$

6. (Bonus!) Which of the following is correct about the system

$$\begin{cases} x + y = 2 \\ \frac{1}{2}y = 1 - \frac{1}{2}x \end{cases} ?$$

- a. The system has infinitely many solutions.
- b. The system has exactly one solution.
- c. The system has no solution.
- d. The system is inconsistent.

**Part II: 5 points each**

7. A car is moving 30 miles per hour. The diameter of its wheel is 5 ft. Find the number of revolutions per minute of the rotating wheels. (1 mile = 5280 ft)

- a.  $\frac{10}{\pi}$  rpm
- b.  $\frac{440}{\pi}$  rpm
- c.  $\frac{2640}{\pi}$  rpm
- d.  $\frac{528}{\pi}$  rpm
- e.  $\frac{264}{\pi}$  rpm

8. Which of the following is/are true?

P.  $\tan\left(-\frac{\pi}{4}\right) = -\tan\left(\frac{\pi}{4}\right)$

Q.  $\cos\left(-\frac{\pi}{3}\right) = \cos\left(-\frac{4\pi}{3}\right)$

R.  $\cos\left(\frac{\pi}{3}\right) = \sin\left(\frac{5\pi}{6}\right)$

- a. P only
- b. Q only
- c. R only
- d. P and Q only
- e. P and R only

9. How many angles below is/are coterminal with  $400^\circ$ ?

$-760^\circ$        $-320^\circ$        $-40^\circ$        $40^\circ$        $760^\circ$

- a. 1                      b. 2                      c. 3                      d. 4                      e. 5
- 

10. Solve:  $\begin{cases} x^2 + y^2 = 25 \\ x - 3y = 5 \end{cases}$

- a.  $(0, 5)$  and  $(5, 0)$                       b.  $(-4, -3)$  and  $(5, 0)$   
c.  $(-3, -4)$  and  $(0, 5)$                       d.  $(3, -4)$  and  $(0, 5)$   
e.  $(-4, 3)$  and  $(5, 0)$
- 

11. Find the number of years required for \$2500 investment to triple at a rate of 12% compounded monthly.

- a.  $\frac{\ln(3)}{\ln(1.01)}$  years                      b.  $\frac{\ln(3)}{\ln(1.12)}$  years                      c.  $\frac{\ln(7500)}{1.12 \ln(2500)}$  years  
d.  $\frac{\ln(3)}{12 \ln(1.01)}$  years                      e.  $\frac{\ln(3)}{12 \ln(1.12)}$  years
- 

12. At a university with 40,000 students, a survey shows that the number of students  $N$  who have heard a piece of information after  $m$  months is given by the formula  $m = 33 - 6 \log(40,000 - N)$ . How many students will learn about the new bus service after 9 months?

- a. close to 40,000 students                      b. 30,000 students                      c. 25,000 students  
d. 20,000 students                      e. 10,000 students

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13. Which of the following is/are equal to 2?

P.  $\log_{\sqrt{4}} 2$

Q.  $\frac{\log 20}{\log 10}$

R.  $\frac{1}{4 \ln \sqrt[3]{e}}$

a. P only

b. Q only

c. R only

d. P and R only

e. P, Q and R only

14. Solve:  $\log_6(x+1) + \log_6(x) = 1$

a.  $x = 1$  only

b.  $x = \frac{7}{2}$  only

c.  $x = -3, 2$  only

d.  $x = -3$  only

e.  $x = 2$  only



MAC 1147 TEST IIIB PART II  
SPRING 2009

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Sect # \_\_\_\_\_ Name \_\_\_\_\_

UF ID \_\_\_\_\_ Signature \_\_\_\_\_

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$x =$  \_\_\_\_\_,  $y =$  \_\_\_\_\_

2. The number,  $N$ , of bacteria in a culture grows exponentially. In the beginning, the number of bacteria is 100. Two hours later, the number of bacteria is 400.

a) Find the model describing the number of bacteria.

$$N = \underline{\hspace{10cm}}$$

b) Find the number of bacteria 4 hours later.

$$N = \underline{\hspace{10cm}}$$

c) Find the time when the number of bacteria reaches 600. (leave  $\ln$  in your answer)

$$t = \underline{\hspace{10cm}}$$

ALG

3. Given the function  $f(x) = 1 + \log_2(-x + 1)$ .

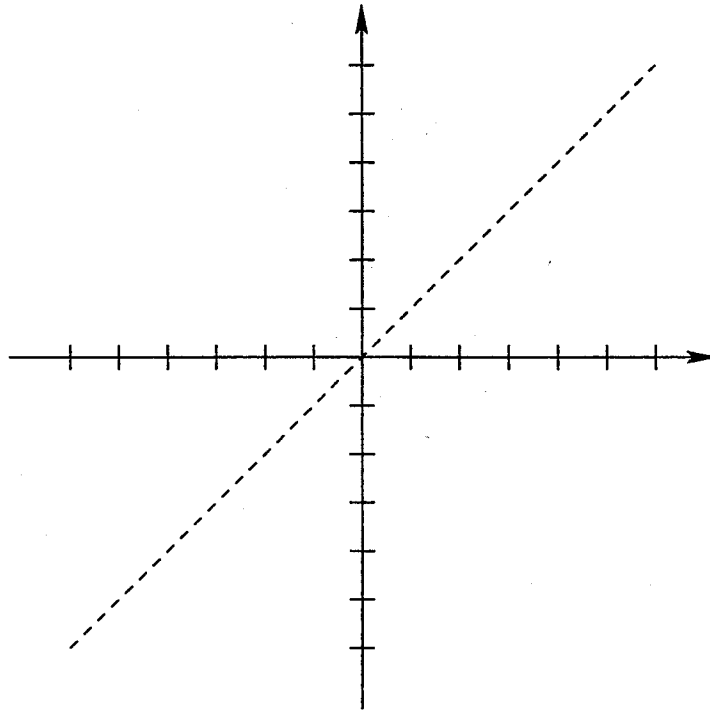
a) Find the following:

- 1) domain of  $f$  \_\_\_\_\_
- 2) equation of the vertical asymptote \_\_\_\_\_
- 3)  $x$ -intercept(s):  $x =$  \_\_\_\_\_

b) Find  $f^{-1}(x)$ .

$$f^{-1}(x) = \underline{\hspace{10cm}}$$

c) Sketch the graphs of  $y = f(x)$  and  $y = f^{-1}(x)$ .



4. Evaluate:

a)  $2 \cos\left(-\frac{\pi}{6}\right) + \sin\left(\frac{7\pi}{6}\right) + \tan\left(-\frac{7\pi}{4}\right)$

b)  $\sin\left(-\frac{\pi}{2}\right) - \tan\left(\frac{\pi}{2}\right) + \cos(-\pi)$