MAC 1147   TEST IIIA
FALL 2010

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 7 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.

NOTE: Be sure to bubble the answers to questions 1–15 on your scantron.

Part I: 3 points each

1. Evaluate: $\sin\left(-\dfrac{4\pi}{3}\right) =$

   a. $-\dfrac{1}{2}$ b. $\dfrac{1}{2}$ c. $-\dfrac{\sqrt{3}}{2}$ d. $\dfrac{\sqrt{3}}{2}$

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2. Which of the following angles does <u>not</u> lie in quadrant II?

   a. $-200°$ b. $\dfrac{7\pi}{8}$ c. 3 radians   d. $-\dfrac{4\pi}{5}$

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3. Which of the following functions is <u>not</u> even?

   a. $x\cos x$ b. $\cos x$ c. $\tan(|x|)$ d. $x\sin x$

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4. Find the range of the function $f(x) = e^{-x+1} + 3$.

   a. $(1, \infty)$ b. $(-1, \infty)$ c. $(3, \infty)$ d. $(-3, \infty)$

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5. Evaluate: $\log_{\frac{1}{8}} \dfrac{1}{4} =$

   a. $-\dfrac{2}{3}$ b. $\dfrac{2}{3}$ c. $\dfrac{1}{2}$ d. 2

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6. (**Bonus!**) Which of the following numbers is negative?

   a. $\log_2 5$ b. $\log_{\frac{1}{2}} 5$ c. $\log 5$ d. $\ln 5$

7. (Bonus!) The system of linear equations $\begin{cases} y = x - 2 \\ \dfrac{1}{5}x + \dfrac{1}{5}y = \dfrac{2}{5} \end{cases}$ has

a. no solution   b. one solution   c. infinitely many solutions

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Part II: 5 points each

8. If $x > 0$ and $y > 0$, which of the following statements is/are correct?

   P. $e^{4\ln x} = 4x$

   Q. $\log(2x^3) = 3\log(2x)$

   R. $\dfrac{\log x}{\log y} = \log(x - y)$

a. none   b. P and Q only   c. Q and R only

d. Q and R only   e. P, Q and R

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9. Find the domain of $\log_5(2x^2 + 7x - 4)$.

a. $(-\infty, \infty)$ b. $(0, \infty)$ c. $\left(\dfrac{1}{2}, \infty\right)$

d. $\left(-4, \dfrac{1}{2}\right)$ e. $(-\infty, -4) \cup \left(\dfrac{1}{2}, \infty\right)$

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10. The number of bacteria in a culture is increasing exponentially. After 2 hours, there are 150 bacteria, and after 6 hours, there are 1350 bacteria. How many bacteria are there initially?

a. 25 bacteria   b. 50 bacteria   c. 75 bacteria

d. 100 bacteria   e. 125 bacteria

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11. Find the inverse of $f(x) = \log(-x + 4) - 1$.

    a. $f^{-1}(x) = -10^{x-4} + 1$ b. $f^{-1}(x) = 10^{x-4} + 1$

    c. $f^{-1}(x) = 10^{x+1} - 4$ d. $f^{-1}(x) = 10^{x+1} + 4$

    e. $f^{-1}(x) = -10^{x+1} + 4$

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12. A deposit of \$1000 is made to a mutual fund. Find the time in years required for the investment to double at an annual interest rate of 6% compounded monthly.

    a. $\dfrac{\ln(2)}{12 \cdot \ln(1.005)}$ years   b. $\dfrac{\ln(2)}{\ln(1.005)}$ years

    c. $\dfrac{\ln(2)}{12 \cdot \ln(1.06)}$ years   d. $\dfrac{\ln(2)}{\ln(1.06)}$ years

    e. $\dfrac{\ln(2000)}{1.06 \cdot \ln(1000)}$ years

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13. Solve: $\log(x) + \log(x + 3) = 1$

    a. $\left\{ \dfrac{7}{2} \right\}$ b. $\left\{ \dfrac{-3 + \sqrt{13}}{2} \right\}$ c. $\{-5, 2\}$

    d. $\{-5\}$ e. $\{2\}$

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14. Solve: $9^x + 3^x = \ln(e^6)$

    a. $\{\log_3 2\}$ b. $\{-1, \log_3 2\}$ c. $\{-2, 3\}$

    d. $\{-3, 2\}$ e. $\{0\}$

15. A pulley has a diameter of 20 cm. It takes 5 seconds for 50 cm of belt to go around the pulley. Find the angular speed of the pulley in radians per minute.

    a. 1 rad/min   b. 30 rad/min   c. 60 rad/min

    d. $\dfrac{30}{\pi}$ rad/min   e. $\dfrac{60}{\pi}$ rad/min

Be sure to work on the free response problems
on the next four pages.

Sect # _____   Name _____

UF ID _____   Signature _____

SHOW ALL WORK TO RECEIVE FULL CREDIT.

1. Assume the x, y and z are all positive real numbers.

   a) Use Change of Base Formula to write $\log_9 x$ as a logarithm with base 3.

   $$\log_9 x = \underline{\hspace{3cm}}$$

   b) Write

   $$\log_9 x - 2\log_3 y - \frac{1}{3}\log_3 z$$

   as a single logarithm with base 3.

   _____

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2. Given the function $f(x) = 1 + \log_2(-x - 2)$.

a) To find the graph $y = f(x)$, we will use the parent function $y = \log_2 x$ to do the transformations in the following order:

1) horizontal shift: shift left/right (circle one) _____ unit(s)
2) reflection: reflect across the _____-axis.
3) vertical shift: shift up/down (circle one) _____ unit(s)

b) The reference point $(1, 0)$ is on the graph of the parent function. Therefore, the new reference point (after transformations) _____ is on the graph of $y = f(x)$.

c) Find the equation of the vertical asymptote _____

d) Find the x-intercept: $x =$ _____

e) Sketch the graph of f and label the new reference point, x-intercept and any asymptotes.
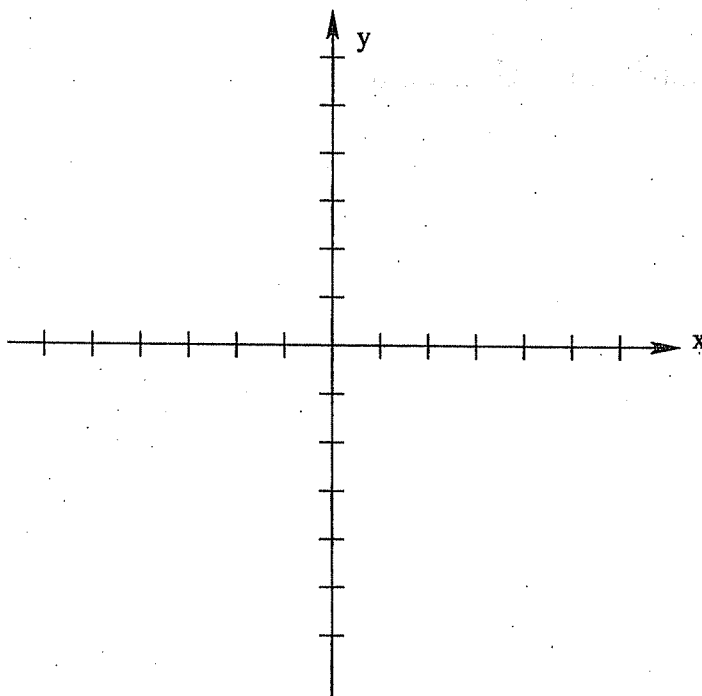
3. Solve the inequality and write your answer in interval notation:

a) $x^4 > 9x^2$

b) $\dfrac{2}{x+1} \geq \dfrac{1}{x-2}$

4. A motorboat traveled 24 miles downstream, with the current, in 3 hours. The return trip upstream, against the current, covered only $\frac{3}{4}$ of this distance, took 4 hours. Assume that the speed of the boat is x mph and the speed of the current is y mph and both remained constant. Use a system of equations to solve for x and y.

$x =$ _____, $y =$ _____