MAC 1147 Review for Exam 3, Spring 2015

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The solutions to this material are provided at the review session. For more information on reviews or our other services, please go to www.teachingcenter.ufl.edu.

1) Solve the systems:
   (a) \[ \begin{cases} 2x - 4y = 6 \\ 7x + 3y = 4 \end{cases} \]
   (b) \[ \begin{cases} \frac{3}{4}x - \frac{2}{3}y = -1 \\ -9x + 8y = 12 \end{cases} \]
   (c) \[ \begin{cases} x^2 + y^2 = 10 \\ 2y - x = -1 \end{cases} \]

2) Solve the following inequalities; write the answers in interval notation.
   a) \( x^5 \geq 27x^2 \)
   b) \( x(x - 1)^2(x + 2)^3(2x + 1)^4 < 0 \)
   c) \( x^3 - 9x - 2 \geq 2x^2 - 20 \)
   d) \( \frac{3x}{x - 1} \leq \frac{x}{x + 4} + 3 \)

3) Sketch graphs of the following functions using key features and transformations. Also show the location of the intercepts and asymptotes.
   a) \( f(x) = 2^{-x^3 - 4} \)
   b) \( g(x) = -\log_2(x + 1) + 2 \)

4) Expand and simplify the expression
   a) \( \log_2 \sqrt[3]{\frac{a - x}{2}} \), \( a > 2 \)
   b) \( \ln \left( \frac{\sqrt{x}}{x^2 e^{-3}} \right) \)
   c) \( 24 \log \sqrt[4]{\frac{x^6 y^4}{\sqrt[z]{z}}} \)

5) Combine into a single logarithmic expression
   a) \( \ln 3 + \frac{1}{2} \ln x + \ln y - \frac{1}{3} \ln z \)
   b) \( \log_2 2 + \log_9(x + 1) - 2 \log_3(1 + \sqrt{x}) \)

6) Solve the following equations:
   a) \( 4x^2 + \frac{1}{64} \)
   b) \( e^{x^2 - 15} = e^{-2x} \)
   c) \( \log(x + 4) - \log x = \log(x - 2) \)
   d) \( \ln(x^2 - 2) = \ln 23 \)
   e) \( \log_4(x + 1) = \log_{64}(x^3 + 2x^2 + 11) \)
7) Solve the following equations:
   a) \( 8(4^{6-2x}) + 17 = 41 \)
   b) \( 81^x + 9^{1+4x} - 32 = 4 \)
   c) \( \log(x + 4) - \log(x) = \log(x - 2) \)
   d) \( \log_a(x + 2)^4 = (\log_2(x + 2))^3 \)

8) A pulley has a diameter of 16 cm. It takes 5 seconds for 80 cm of the belt to go around the pulley. Find the angular speed of the pulley in radians per minute.

9) A car’s rear windshield wiper rotates 125°. The total length of the wiper mechanism is 25 inches yet only the 14 inch wiper blade actually wipes the windshield. Find the area covered by the wiper blade.

10) In the Land of Oz in 1999, the population of winged monkeys was 10,000. In 2009, the population is 2500. What will the population be in 2014, assuming exponential decay?

11) The concentration of a drug in an organ at any time \( t \) (in seconds) is given by where \( x(t) = 0.08 + 0.12(1 - e^{-0.02t}) \) is measured in grams/cubic centimeter (g/cm³).
   a) What is the initial concentration of the drug in the organ?
   b) Give an exact answer for how long will it take for the concentration of the drug in the organ to reach 0.17 g/cm³?

12) A deposit of $4000 is made in a trust fund that pays 6.5% interest. How long will it take the money to quadruple, if the interest is compounded
   a) Weekly
   b) Continuously

13) Find the complement and supplement of 75°, and convert them to radians.

14) Solve the following equations for \( x \):
   a. \( e^{2x} - 2e^x = 8 \)
   b. \( e^{2\ln(x)} = 3x - 2 \)