Sample Problems for Exam 3
College Algebra and Trigonometry, Math 123, Secton 3260, Fall 2011
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- Exam 3 will be held in class on Wednesday Dec 7th.

- Syllabus for Exam 1: 4.4, 4.5, 5.1, 5.2, 5.3

- Review for Exam 3 will be held on Wednesday Dec 5th.

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1. Solve the following equations.

    (a) $3^{4x+5} = 9$

    (b) $3^{x+2} = 4^{3x}$

    (c) $\log_3(5 + 2x) = 2$

    (d) $3\ln(5 - x) = 4$

2. The stray-cat population in a small town grows exponentially. In 1999, the town had 30 stray cats and the relative growth rate was 15 % per year.

    (a) Find a function that models the stray cat population.

    (b) Find the projected population after 4 years.

    (c) Find the number of years required for the stray-cat population to reach 500.

3. A culture contains 10,000 bacteria initially. After an hour the bacteria count is 25,000.

    (a) Find the relative growth rate.

    (b) Find the doubling period.

    (c) Find the number of bacteria after 3 hours.

4. A sample of bismuth-210 decyaed to 33 % of its original mass after 8 days.

    (a) Find the half-life of this element.

    (b) Find the mass remaining after 12 days.

5. A wooden artifact from an ancient tomb contains 55 % oof the carbon-14 that is present in living trees. How long ago was the artifact made ? (The half-life oof carbon-14 ois 5730 years).

6. A car engine runs at a temperature of 190°F. When the engine is turned off, it cools according to Newtons Law of Cooling with constant $k = 0.0341$, where time is measured in minutes. Find the time needed for the engine to cool to 90°F if the surrounding temperature is 60°F. (Look up Newton's Law from book, will be given on exam).

   The problems below are to be done without a calculator. You must justify and show all your work. Write your answers as fractions.

7. The point $P(x, y)$ is on the unit circle in quadrant III. If $x = \sqrt{3}/5$, find y.

8. The point P determined by t has y-coordinate 3/5. Find
   (a) $\sin t$ (b) $\cos t$ (c) $\tan t$
   (d) $\csc t$ (e) $\sec t$ (f) $\cot t$

9. If $\cos t = 7/9$ and if the terminal point determined by t is in quadrant IV, find the exact values of the 5 other trigonometric functions.

10. If $\sin t = -2/3$ and if the terminal point determined by t is in quadrant III, find $\tan t + \sec t$.

11. Find the quadrant in which the following angles lie, find the reference numbers for the angle and use it to find the exact value of the following.
    (a) $\sin(\dfrac{5\pi}{6})$ (b) $\cos(\dfrac{11\pi}{4})$
    (c) $\tan(\dfrac{-7\pi}{3})$ (d) $\sin(240°)$

12. Find the amplitude, period and phase shift of the following functions. Sketch one period of the graph. Mark five equidistant points on the x-axis.
    (a) $y = -5\cos 4x$ (b) $y = 2\sin(x/2 - \pi/6)$ (c) $y = -\sin(2x + \pi)$

13. Find the period and phase-shift. Sketch one period of the graph.
    (a) $y = \tan(2x - \pi/2)$ (b) $y = 2\cot(x/2 + \pi)$

14. Fill in the table using exact values.

θ	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
$\sin\theta$					
$\cos\theta$					
$\tan\theta$					