Precalculus-04, Test 3 Review

Dr. Graham-Squire, Fall 2013

•Some practice problems to work on:

1. Bob invests \$10,000 in a bank account at 4% interest, compounded continuously.

   (a) How much money will he have in the account after 5 years? Round to the nearest dollar. **Ans**: \$12,214

   (b) How many years will it take until he has \$21,000 in the account? Round to the nearest 0.1 years. **Ans**: 18.5 years

2. Radioactive iodine is used as a tracer to diagnose certain thyroid gland disorders. It decays in such a way that the mass (in grams) remaining after t days is given by the exponential decay function, with $P = 6$ and $r = -0.087$. Answer the first two questions *without* using a calculator. You will need a calculator to answer the third question.

   (a) How much of the iodine is present initially? **Ans**: 6 grams

   (b) How much iodine will be left in the body over the long run (that is, as t goes to infinity)? **Ans**: 0 grams

   (c) How long does it take for the half of the iodine to leave the body? **Ans**: 7.96 days

3. Use the definition of logarithm to solve the equations. You should be able to do these without a calculator.

   (a) $\log_4 2 = x$ **Ans**: $1/2$

   (b) $\log_4 x = 2$ **Ans**: 16

   (c) Evaluate $\log_5 100 - \log_5 10 + \log_5 5 - \log_5 2$ **Ans**: 2

4. Use laws of logarithms to completely expand the expression $\ln\left(\dfrac{e^x}{x(x^2+1)(x^4+1)}\right)$.

   Ans: $x - \ln x - \ln(x^2+1) - \ln(x^4+1)$

5. Solve the equations. Round your answer to the nearest 0.01.

   (a) $7^{x/2} = 5^{1-x}$ **Ans**: $x = 0.62$

   (b) $\log_{10} x + \log_{10}(x-3) = 1$ **Ans**: $x = 5$ is the only solution. $x = -2$ does not work because it gives the log of a negative number when you plug it back in, which is not allowed.

6. The bat population in a certain region was 350,000 in 2009, and the observed doubling time for the population is 25 years. When will the population reach 2 million? **Ans**: The year 2072

7. The half-life of palladium is 4 days. After 20 days a sample has been reduced to a mass of 0.375 grams. After how many days was exactly one gram left? **Ans**: 14.33 days

8. (a) Find the reference number for $t = \frac{-35\pi}{4}$. **Ans**: $\bar{t} = \frac{\pi}{4}$

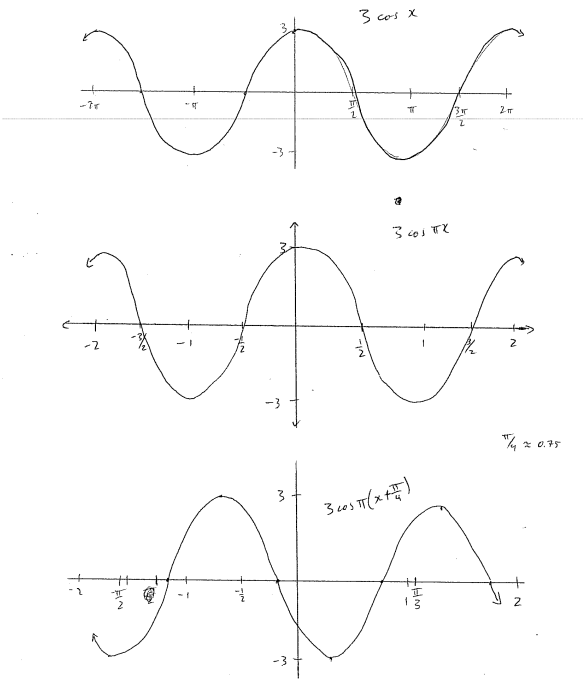
   (b) Find the terminal point for $t = \frac{41\pi}{6}$. **Ans**: $\left(\frac{-\sqrt{3}}{2}, \frac{1}{2}\right)$

9. (a) Find $\cos t$ and $\csc t$ if $\tan t = \frac{1}{4}$ and t lies in Quadrant III. **Ans**: $\cos t = -4/\sqrt{17}$, $\csc t = -\sqrt{17}$

   (b) Without a calculator, find the following. If an expression does not exist, write DNE and explain why it does not exist.

(i) $\sin \frac{3\pi}{4} = \frac{\sqrt{2}}{2}$ (ii) $\tan \frac{-7\pi}{3} = -\sqrt{3}$ $\sec \frac{7\pi}{2} =$ dne, because you cannot divide by zero, and cosine of $3\pi/2$ is zero.

10. Without a calculator, sketch a graph of $y = 3\cos\left(\pi\left(x + \frac{\pi}{4}\right)\right)$.



11. Without a calculator, sketch a graph of $y = \cot 3\left(x - \frac{\pi}{6}\right)$.