

**Math 32, Spring 2010, Section 101**  
**Worksheet 8**

Work through the following problems in groups of about four. Take turns writing; everyone should get a chance to write for some of the problems. It's more important to understand the problems than to do all of them.

1. Assume that the population of a bacteria colony grows exponentially (i.e. according to the law  $N(t) = N_0e^{kt}$ .) At the start of an experiment, 2000 bacteria are present in a colony. Eight hours later, the population is 3000.
  - (a) Determine the constants  $N_0$  and  $k$  in the model.
  - (b) What was the population two hours after the start of the experiment?
  - (c) How long will it take for the population to triple?
2. Given that  $\beta$  is an acute angle and that  $\sin \beta = 2/5$ , find the values of the other five trigonometric functions at  $\beta$ .
3. Suppose the points  $A$ ,  $B$  and  $C$  form a right triangle, with the right angle at point  $C$ . Suppose the angle  $A$  is 60 degrees and that  $AB = 12\text{cm}$ . Find  $AC$  and  $BC$ .
4. The element WillieNelsonium-32 is observed to decay according to the law  $N(t) = N_0e^{47t}$ . What is the half-life of WillieNelsonium-32?
5. Explain with pictures why  $\sin \theta \leq 1$  and  $\cos \theta \leq 1$ , but  $\tan \theta$  can potentially be really big or really small.