

You have 20 minutes to take this quiz. Each problem will be graded for clarity of work as well as correctness, so show all work **clearly and in order**. Circle or otherwise indicate your final answers. Please note that there are problems on both the front and the back of this page.

**NO CALCULATORS ON THIS QUIZ**

**1. (9 points) [Similar to #14, 8.6]**

Suppose a quantity  $Q(t)$ , with  $t$  measured in years, increases by 8% each year. Give *exact* answers to each of the following questions, and be sure to show your work clearly (don't just use memorized formulas).

a. (3 pts) Find a formula for  $Q(t)$ .

b. (3 pts) What is the doubling time of  $Q(t)$ ?

c. (3 pts) What is the continuous growth rate of  $Q(t)$ ?

*Turn over for more...*

**2.** (10 points) [Similar to #12, 8.7]

Consider the *incorrect* limit calculation below:

$$\lim_{x \rightarrow 0} \frac{x^2 - x}{2^x - 1} \stackrel{\text{L'H}}{=} \lim_{x \rightarrow 0} \frac{2x - 1}{(\ln 2)2^x} \stackrel{\text{L'H}}{=} \lim_{x \rightarrow 0} \frac{2}{(\ln 2)^2 2^x} = \frac{2}{(\ln 2)^2 2^0} = \frac{2}{(\ln 2)^2}.$$

**a.** (5 pts) Find the error in the calculation above, and clearly explain why it is an error.

**b.** (5 pts) Calculate  $\lim_{x \rightarrow 0} \frac{x^2 - x}{2^x - 1}$  correctly.

Write whatever you want in this box for one point.