

Math 026L.04 Spring 2002  
Quiz #5

Name: \_\_\_\_\_

You have 20 minutes to complete this quiz which is worth 20 points. Calculators are permitted, but no other aids are allowed. Show all work neatly and in order, and clearly indicate your final answers. Answers must be justified whenever possible in order to earn full credit. When you do use your calculator, sketch all relevant graphs and write down all relevant mathematics.

**1.** (8 points) Newton's Law of Cooling states:

*The rate of change in temperature of a cooling body is proportional to the difference between the temperature of the body and the surrounding temperature.*

Write a differential equation that expresses Newton's Law of Cooling where temperature is denoted as  $T$  and time is denoted as  $t$ . Let  $T^*$  be the surrounding temperature and  $k$  be the constant of proportionality.

**2.** (12 points) A yam<sup>1</sup> is put in a 200°C oven and heats up according to the differential equation

$$\frac{dH}{dt} = k(H - 200)$$

for some constant  $k$ .

(a) If the yam is at 20°C when it is put in the oven, solve the differential equation.

(b) Find  $k$  using the fact that after 30 minutes the temperature of the yam is 120°C.

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<sup>1</sup>A **yam** is a moist-fleshed and usually orange-fleshed sweet potato (Merriam-Webster's Collegiate Dictionary).