Math 172 **Quiz 7** **March 17, 2006**

Name ____________________________

1. Given the following initial value problem, use Euler's Method with $\Delta t = 2$ to estimate $w(6)$.

$$\frac{dw}{dt} = \ln(w+1), \qquad w(0) = 10$$

2. Suppose y is a function of t which satisfies the differential equation

$$\frac{dy}{dt} = \frac{4(y-5)(y-20)}{21}$$

(a) Sketch a rough graph of y given that $y(0) = 15$

(b) Find all real values of y for which the quantity y is increasing.

(c) Find all real values of y for which the quantity y is decreasing.

(d) For which values of y is the quantity y in equilibrium? Determine whether each of these equilibrium values is stable or unstable.

3. Using P for your dependent variable, t for your independent variable, and k, r, m, or C for any necessary constants, write down the general form for a differential equation which models each of the following types of growth.

   (a) logistic growth

   (b) linear growth

   (c) exponential growth

4. Suppose that 500 trout are released into a man-made lake which had no trout before. Further suppose that the trout population, P, grows logistically according to the following differential equation where t represents the number of years since the initial release of the trout.

$$\frac{dP}{dt} = 0.1P\left(1 - \frac{P}{2500}\right) \qquad \text{and} \qquad P(0) = 500$$

   (a) As a percentage, what is the intrinsic growth rate of this trout population?

   (b) What is the carrying capacity for this trout population?

   (c) Sketch a rough graph of this trout population being sure to show any long-term behavior.