Written Assignment #1:
Separable Equations
Due 5:00pm Tuesday, February 3, 2004

You are encouraged to collaborate with your colleagues. For credit, however, your final write-up must be done individually. Show all your work and make your presentation comprehensible.

1. Find \( y(1) \) if \( \frac{dy}{dx} = \frac{e^x}{2y + 1} \) and \( y(0) = -2 \).

2. (a) Newton’s Law of Cooling (or Heating) provides a simple model for the change in an object’s temperature in a surrounding environment with a constant temperature. In words, the law states that the instantaneous rate of change of the temperature of an object is proportional to the difference in temperature between the object and its surrounding environment. Write a differential equation that expresses Newton’s Law of Cooling mathematically. Use \( k > 0 \) for the constant of proportionality, \( \beta \) for the constant temperature of the surrounding environment, \( T \) for the temperature of the object, and \( t \) for time.

(b) Suppose that the constant of proportionality in Newton’s Law is .08/hr for coffee. In a room with a constant temperature of 60°F, the temperature of a cup of coffee is measured to be 200°F. What is temperature of the coffee 3 hours later?

(c) A forensic specialist measured the temperature of a murder victim’s body at 11:00pm and found it to be 90.1°F. At 11:30pm, the temperature was 89.5°F. Assuming the victim’s normal body temperature was 98.6°F, at what time was the murder committed if the temperature of the room was a constant 70°F?