

**Second Exam**  
*Wednesday, October 3, 2007*

This exam is closed book. Make sure your name is on all pages. Show all work, and show it in a logical and organized manner. Each entire problem is worth 50 points.

1. Solve the initial value problem

$$\frac{dy}{dx} = \frac{2 - e^x}{3 + 2y}, \quad y(0) = 0,$$

and determine where the solution attains its maximum value.

2. A pond of total volume 10,000 cubic meters has a flow entering it of 10,000 cubic meters per year. There is a pollutant entering the pond, whose concentration in grams per cubic meter is decreasing as a function of  $t$  years, according to

$$c_{\text{in}}(t) = 100(1 - t/10),$$

so that, after 10 years, the water entering the pond is pure. Assume that water is flowing out of the pond at the same rate that it is flowing in, and that the initial concentration in the pond is 100 grams per cubic meter.

- (a) Find the concentration  $c(t)$  of pollutants in the pond as a function of time  $t$ .
- (b) What is the concentration after 10 years?