MATH 2171 **Test 1** **Fall 2001**

Name : _____

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1. Find the general solution of the following differential equation:

$$y' = \frac{(x^2-1)y^4}{x(y^2-3)}.$$

2. Solve the following initial-value problem

$$xy' + 3y = 8x^5,\ y(1) = 2.$$

3. For the equation $\frac{dx}{dt} = x^2 - 3x + 2$, find all the equilibrium solutions and classify each one as asymptotically stable or unstable.

4. Carbon extracted from an ancient skull contained only one-seventh as much ^{14}C as carbon extracted from present-day bone. How old is the skull? (Let $N(t)$ be the amount of ^{14}C. Then $N(t) = N_0 e^{-0.0001216t}$ if t is measured in years.)

5. Suppose that at time $t = 0$, half of a "logistic" population of 200,000 persons have heard a certain rumor, and that the number of those who have heard it is then increasing at the rate of 4000 persons per day. How long will it take for this rumor to spread to 90% of the population? (Hint : For the initial value problem

$$\frac{dP}{dt} = kP(M - P), \quad P(0) = P_0,$$

the solution is

$$P(t) = \frac{P_0 M}{P_0 + (M - P_0)e^{-kMt}}.)$$

6. Find approximate values of the solution of the given problem

$$y' = x - y,\ y(0) = 1$$

at $x = 0.1$ and 0.2 using the Euler method with $h = 0.1$.