AMS 361- Applied Calculus IV  
Spring 2007  

FIRST TEST B

1. (10 points) Find the general solution of the differential equation.

\[ xy + 4y^2 - x^2 y' = 0 \]

2. (15 points) The differential equation is

\[ (\cos x - \ln y)dx + \left( e^y - \frac{x}{y} \right) dy = 0 \]

(a) (5 points) Verify that the given differential equation is exact.

(b) (10 points) Solve the given differential equation.

3. (15 points) The differential equation is

\[ \frac{dy}{dx} + \frac{6}{x} y - 4y^2 = \frac{1}{x^2} \]

(a) (5 points) Show that the substitution \( y(x) = x^{-1} + u(x) \) transform the differential equation into the Bernoulli equation.

(b) (10 points) Solve the resulting Bernoulli equation.

4. (10 points)

The time rate of change of a rabbit population \( P \) is proportional to the square root of \( P \). At time \( t = 0 \) (months) the population numbers 100 rabbits and is increasing at the rate of 40 rabbits per month. How many rabbits will there be one year later?