

MA 238-02: TEST 1 (2/10/09)

1 [20 pts] Find the general solution of the equation

$$\frac{dy}{dx} = e^{2x+3y+4}.$$

2 [20 pts] Find the solution to the initial-value problem

$$x \frac{dy}{dx} = 3y + \sqrt{x}, \quad y(1) = 2.$$

3 [20 pts] Find the general solution of the equation

$$\frac{dy}{dx} = \frac{y}{x+y}.$$

4 [20 pts] (i) Let $y = y(x)$ be the solution of the initial value problem

$$\frac{dy}{dx} + 2x = \sqrt{y + x^2}, \quad y(0) = 0.$$

(i) Use the Euler's method with the step size $h = \frac{1}{2}$ to find an approximate value for $y(1)$.

(ii) Use the substitution $u = y + x^2$ to find the exact solution to the above initial value problem and then find $y(1)$.

5 [20 pts] Consider the exponential growth model

$$\frac{dI}{dt} = \beta I.$$

(i) Write the general solution formula for $I(t)$.

(ii) Assume that $I(0) = 2$ and $I(10) = 50$. Find $I(30)$.