Differential Equations, MAT 3613
Midterm, October 18, 1995
Instructor: D. Gokhman

Name: _____

Show all work. Answers alone are not sufficient. Box the answers.

1. (20 pts.) Solve the initial value problem $y' = y$, $y(0) = -2$.

2. (80 pts.) For each of the following differential equations, determine whether the equation is linear, homogeneous, separable, exact or a combination thereof. You may need to transform the equation before making the determination.
   Find all solutions.

$$\text{(a)} \quad \frac{dy}{dx} = e^x - \frac{1}{x}y \qquad\qquad \text{(b)} \quad \frac{dy}{dx} = e^{x+y}$$

$$\text{(c)} \quad \frac{dy}{dx} = \frac{3x^2 y + e^y}{2y - x^3 - xe^y} \qquad\qquad \text{(d)} \quad \frac{dy}{dx} = \frac{y}{x} + \frac{x}{y}$$

3. (20 pts.) Consider the initial value problem $y' + y^2 = x^2$, $y(0) = 0$.

   (a) Convert the differential equation for y to an integral equation.

   (b) Let $y_0(x) = 0$ and find the Picard iterates y_1, y_2, y_3.
       You do not need to multiply out the numbers.

1	2a	2b	2c	2d	3	total (120)