

Problem 1:

(25 points) Given the following linear system of equations solve for the variables using the Gauss Elimination (row reductions) and demonstrate if the solution is unique, no solution exists, or if infinitely many solutions exist?

$$8x_2 + 2x_3 = -7$$

$$3x_1 + 5x_2 + 2x_3 = 8$$

$$6x_1 + 2x_2 + 8x_3 = 26$$

Problem 2:

(25 points) Solve the following differential equation: $\ddot{y} + 0.2\dot{y} + 4.01y = 0$, given that $y(0) = 0$ and $\dot{y}(0) = 2$

Problem 3:

(25 point) Find first and second derivatives of the following expression:

$$y = -\frac{\cos x}{2 \sin^2 x} + \ln \left(\sqrt{\frac{1 + \cos x}{\sin x}} \right)$$

Problem 4:

(25 points) Find the indefinite integral:

$$\int \frac{\ln x \, dx}{x\sqrt{1 + \ln x}}$$

Solve problems on separate pages.