Midterm Exam II ENGR 213
Applied Ordinary Differential Equations

SAMPLE

Problem 1. Determine whether the functions

$$f_1(x) = 1, \quad f_2(x) = x, \quad f_3(x) = x^2, \quad f_4(x) = x^3, \quad f_5(x) = 5x^3 + (x-2)^2$$

are linearly dependent or linearly independent on the interval $(0, \infty)$.

Problem 2. Solve the differential equation

$$y'' - 2y' + 2y = xe^{-x}.$$

Problem 3. Solve the following boundary-value problem

$$y'' - 6y' + 9y = 4e^{2x}\sin(x), \quad y(0) = 4, \quad y(\frac{\pi}{2}) = 0.$$

Problem 4. Solve the differential equation

$$y'' + 3y' + 2y = \frac{1}{e^x + 1}.$$

Problem 5. Find a general solution of the differential equation

$$xy'' - (1 + x^2)y' = 0.$$