Ryerson University
Department of Mathematics, Physics and Computer Science

Math 281 Test 2
November 07th, 2003

Problem 1[8]. Given that $y_1 = x^2$ is a solution of

$$x^2y'' + 2xy' - 6y = 0,$$

find a second solution y_2 and show that y_1, y_2 form a fundamental set of solutions to the given equation.

Problem 2[8]. Solve

$$(D^3 + 2D^2 - 5D - 6)y = 0, \text{with } 0 = y(0) = y'(0), y''(0) = 1.$$

Problem 3[6]. Find a linear differential operator that annihilates
(a) $e^{-x} + 2xe^x - x^2e^x$
(b) $e^{-x}\sin x - e^{2x}\cos x$

Problem 4[6]. Find a linear differential equation having $y_1 = x^2e^{-x}\cos(3x), y_2 = x^2$ and $y_3 = \sin(2x)$ as solutions.

Problem 5[8] (i) The auxiliary equation for a homogeneous linear differential equation is

$$r^2(r^2+1)^3(2r-1)^3(r^2-3r+2)^4 = 0.$$

Find a fundamental set of solutions to the equation.

(ii) Find a linear differential equation having $y_1 = x^{\sqrt{2}}\cos(3\ln x)$ and $y_2 = x^{\sqrt{2}}\sin(3\ln x)$ as solutions.