American University of Beirut

MATH 202

Differential Equations

Spring 2009

quiz # 2

Exercise 1 Find the general solution of the given differential equation (*do not find the constants)*

a) $y''' - y'' = 6$

b) $y'' - 4y' + 5y = e^{-x} + 2\cos(2x)$

c) $y^{(4)} - 2y'' + y = 1 + x - xe^{x} + \sin x$

Exercise 2 Find the general solution of $y'' - y = \dfrac{2e^{x}}{e^{x} + e^{-x}}$

Exercise 3 Consider the differential equation

$$(E):\ x^2y'' - (x^2 + 2x)y' + (x + 2)y = x^3$$

a) check that $y_1 = x$ is solution of (E_0)

b) let $y_2 = xu(x)$. Show that $u(x)$ satisfies a first order linear differential equation; find $u(x)$ then find the general solution of (E) on $(0, \infty)$.

Exercise 4 Use the substitution $x = e^{t}$ to solve the Cauchy-Euler differential equation

$$x^2y'' - xy' + y = x(\ln x)^2$$

on $(0, \infty)$.

Exercise 5 Find two power series solutions of the differential equation $y'' - xy' + y = 0$ about the ordinary point $x = 0$. Give the radius of convergence.

(give c_n explicitly.)