HOMEWORK #9 (Chapter 5 Exercises--- Two Special Equations)

Due on Dec. 14

1) Find the general solution of the given differential equation on $(0, \infty)$

$4x^2y'' + 4xy' + (4x^2 - 25)y = 0$ (page 264, Problem 3)

a) rewrite the given DE into the standard form of Bessel's equation

b) identify the value of υ

c) write out the Bessel function of the first kind of order υ and $-\upsilon$

d) are your J_ν and $J_{-\nu}$ linearly independent ? why ?

e) write out the general solution of the given differential equation on $(0, \infty)$

2) Find the general solution of the given differential equation on $(0, \infty)$

$xy'' + y' + xy = 0$ (page 264, Problem 5)

a) rewrite the given DE into the standard form of Bessel's equation

b) identify the value of υ

c) write out the Bessel function of the first kind of order υ and $-\upsilon$

d) are your J_ν and $J_{-\nu}$ linearly independent ? why ?

e) write out the Bessel function of the second kind of order υ

f) write out the general solution of the given differential equation on $(0, \infty)$

3) Find the general solution of the given differential equation on $(0, \infty)$

$x^2y'' + xy' + (9x^2 - 4)y = 0$ (page 264, Problem 7)

a) write out the general solution of $x^2y'' + xy' + (x^2 - 4)y = 0$

b) by referring to $x^2y'' + xy' + (\lambda^2x^2 - 4)y = 0$, identify the value of υ

c) write out the general solution of $x^2y'' + xy' + (9x^2 - 4)y = 0$ on $(0, \infty)$

4) Legendre's equation and Legendre polynomials (page 265, Problem 35)

a) write out the standard form of the Legendre's equation

b) write out the general solution of the Legendre's equation

c) explain what the Legendre polynomials is

d) write out the Legendre polynomials $P_5(x)$, $P_6(x)$

e) write the differential equation for which $P_5(x)$ is a particular solution

f) write the differential equation for which $P_6(x)$ is a particular solution