

NAME:

ID #:

SECTION:

GRADE: #1

#2

#3

Math 202

Quiz # 2, November 24, 2007

Answer all questions. Maximum time allowed **60** minutes.

1. (35 pts.) Use the formula

$$\Gamma\left(1 + \frac{1}{2} + n\right) = \frac{(2n+1)!}{2^{2n+1}n!} \sqrt{\pi}$$

and the definition of J_ν to express the Bessel function $J_{-\frac{1}{2}}$ in terms of simple functions. Then find the general solution of the differential equation

$$x^2 y'' + xy' + \left(25x^2 - \frac{1}{4}\right)y = 0.$$

2. (35 pts.) Use an extended power series to find two linearly independent solutions centered at 0 of the differential equation

$$x(x+1)y'' + 4y' - 2y = 0.$$

Show clearly the recurrence relations and indicate the arbitrary constants. Obtain the general term, and write down each solution separately, simplifying as far as possible.

3. (35 pts.) Use the method of variation of parameters to find a particular solution of the following Cauchy-Euler equation

$$x^2 y'' + xy' + 4y = 5x.$$

Hint: $I = \int \sin(\beta \ln x) dx$ may be evaluated using two integrations by parts.