Math 335
Exam 1

NAME: _____

You have 75 minutes to complete this exam. No notes or calculators are allowed. Show all work. Unsupported or illegible answers will receive no credit.

There are a total of 50 points on this exam.

PAGE	SCORE	POINTS
1		6
2		6
3		10
4		8
5-6		20
TOTAL		50

1.) *[6 points]* Shift the series below so that the variable is x^n.

a.) $\displaystyle\sum_{k=2}^{\infty} a_k x^{k+1}$

b.) $\displaystyle\sum_{i=4}^{\infty} (i+3)b_{i-1} x^{i-2}$

2.) *[6 points]* Find all singular points of the ODE below and classify the points as regular or irregular. Show work to justify your classification.

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

3.) *[10 points]* Find the first 5 terms (through x^4) of the series solution about x=0 of the ODE

$$3y'' - 2xy = 0$$

Write your coefficients in the blanks below in terms of a_0 and a_1.

$y = a_0 + a_1 x + \underline{\quad 0 \quad} x^2 + \underline{\quad \dfrac{a_0}{9} \quad} x^3 + \underline{\quad \dfrac{a_1}{18} \quad} x^4 + \cdots$

4.) *[8 points]* Use your answer to #3 to find the solution of the Initial Value Problem

$$3y'' - 2xy = 0, \qquad y(0) = 2, \qquad y'(0) = 1$$

Write the series through x^4, as in the last problem.

5.) *[20 points]* Note x=0 is a regular singular point of the ODE

$$xy'' + 3y' + 10y = 0$$

Using the Method of Frobenius about x=0, find the indicial roots of the ODE and the general recurrence relation in terms of n and r. *(You do not need to find the Frobenius series solutions. The next page is left blank if you need more room for your work.)*

#5 continued...