Math 335, Fall 2014
Exam 2

NAME: _____

PLEASE PRINT

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		10
2		10
3		10
4		20
TOTAL		50

1.) *[10 points]* Combine the series below into one series. Clearly indicate and simplify any extra terms you pulled out of the series.

$$\sum_{k=0}^{\infty} a_k x^k - 4\sum_{k=0}^{\infty} a_{k+1} x^{k+1}$$

$$(x+3)\sum_{k=2}^{\infty} a_{k-1} x^k + 2\sum_{k=0}^{\infty} a_k x^k$$

2.) *[10 points]* On the homework, you showed that the power series solution about $x = -2$ to they Airy equation $y'' - xy = 0$ is given by

$$y = a_0 + a_1(x+2) - a_0(x+2)^2 + \left(\frac{1}{6}a_0 - \frac{1}{3}a_1\right)(x+2)^3 + \cdots$$

where a_0 and a_1 are unknown constants. Use this information to find the first 4 terms of the specific power series solution about $x = -2$ to the initial value problem

$$y'' - xy = 0, \qquad y(-2) = 3, \qquad y'(-2) = 9$$

Write your answer in the blanks below.

$y =$_____ + _____ $(x+2)$ + _____ $(x+2)^2$ + _____ $(x+2)^3 + \cdots$

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

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

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

$y = a_0 + a_1 x +$_____$x^2 +$_____$x^3 +$ _____$x^4 + \cdots$

4.) *[20 points]* Note x=0 is a regular singular point of the ODE

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

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 back of this page is blank if you need more room.)*