Spring 2021 Math 20D Lecture B Homework #8

Due Sunday, 11:59pm, May 30th

Submit this homework through Gradescope.
Topics covered: section 8.3

1. Find a power series solution centered at $x = 0$ to the differential equation $y' + 2y = 0$. Your answer should include a general formula for the coefficients. Then explain why your solution is the same as $y = a_0 e^{-2x}$ (You can find a hint on the next page of this document. But we suggest you first try to solve it by yourself without looking at the hint).

2. Solve the initial value problem using a power series centered at $x = 0$. Write out the first four nonzero terms of the infinite series:

$$y'' - xy' - y = 0, \quad y(0) = 2,\ y'(0) = -1.$$

3. Solve the initial value problem using a power series centered at $x = 0$. Write out the first four nonzero terms of the infinite series:

$$(1 - x)y'' + y = 0, \quad y(0) = 3,\ y'(0) = 0.$$

Hint for Question 1: $a_{k+1} = \frac{-2a_k}{k+1}$ implies $a_k = \frac{(-2)^k}{k!}a_0$ for all k.