

Math 3213 - Differential Equations

Homework #7 - 2007.03.05

Due Date - 2007.03.12

Name: _____

Consider the differential equation

$$xy'' - (x + N)y' + Ny = 0.$$

1. Verify that one solution is given by $y_1(x) = e^x$.
2. By setting $y_2(x) = c_2v(x)y_1(x)$, derive a new differential equation for $v(x)$.

3. Solve the equation found in problem 2 and show that

$$v(x) = \int x^N e^{-x} dx.$$

4. Find a closed form for the $v(x)$ found in problem 3.

5. If $c_2 = -\frac{1}{N!}$, what function is $y_2(x)$ the N th Maclaurin series the approximation of?

Solve the following differential equations:

6. $y'' + 9y = x \cos(x)$

7. $y'' - 4y' + 3y = 1$

8. $y'' - y = 4xe^x$

9. $y'' + 4y = \cos(2x) + \cos(4x)$