Math 2150 - Test 2 - Fall 2025

Name:_____

Directions:

Show steps for full credit.
Also so I can give you partial credit if needed.

Score			
1		2	
3		4	
5		Total	

1. [10 points]
One can show that the solution to $y'' - 10y' + 25y = 0$ is $y_h = c_1 e^{5x} + c_2 x e^{5x}$. You do not have to verify the above.

(a) Use undetermined coefficients to find a particular solution y_p to

$$y'' - 10y' + 25y = 30x + 3$$

(b) State the general solution to $y'' - 10y' + 25y = 30x + 3$.

2. [**10 points**] Consider the ODE

$$y'' - 4y' + 4y = (x+1)e^{2x}$$

One can show that the solution to the homogeneous equation is given by

$$y_h = c_1 e^{2x} + c_2 x e^{2x}$$

You do not have to verify the above.
Use variation of parameters to find a particular solution y_p to

$$y'' - 4y' + 4y = (x+1)e^{2x}$$

3. [**10 points**] Suppose you are given that a solution to

$$x^2y'' + 2xy' - 6y = 0$$

is $y_1 = x^2$ on $I = (0, \infty)$

(a) Find another solution y_2 that is linearly independent to y_1.

(b) State the general solution to $x^2y'' + 2xy' - 6y = 0$ on I.

4. [**10 points**] Find a power series expansion for $f(x) = x^2 + x + 1$ centered at $x_0 = 2$. State the radius of convergence r for the series.

5. [**10 points**] (a) Find the first four non-zero terms for the power series solution to

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

(b) For what values of x does the power series converge? That is, what is radius of convergence r of your solution?

(Extra page if you need it.)