Math H1b Quiz 5

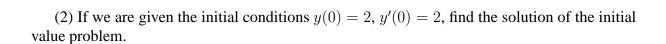
Don't forget to write down clearly your **Name**:

and **ID number**:

- **1. True or False (5 points).** Mark the box in front of a correct answer.
 - \square If both y = f(x) and y = xf(x) are solutions of a second order differential equation, then they are linearly independent.
 - \Box The differential equation ay'' + by' + cy = 0, when $b^2 4ac = 0$, has only one solution.
 - \square The differential equation 5y'' + xy' = y is non-homogeneous.
 - $\Box y = \sin x$ is a particular solution of $y'' + y' + y = \cos x$.
 - \square If y = f(x) and y = g(x) are both solutions of y'' + y = x, then y = f(x) + g(x) is also a solution of the same equation.
- **2. Initial Value Problem (10 points).** Consider the following second order differential equation

$$y'' - 6y' + 8y = 0,$$

(1) Use $y = e^{rx}$ as a text solution, determine the conditions on r for y to be a solution. Write down the form of a general solution of the differential equation.



3. Series solution (5 points). Consider the differential equation

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

and let $y = \sum_{n=0}^{\infty} c_n x^n$ be a series solution. Write down the recursive relation on the coefficients c_n $(n=0,1,2,\ldots)$ determined by the differential equation.