Math 252 Test Two
Section X01

Time: 50 Minutes
Total: 20 Marks

Name:_____

1. [3 marks] A large tank initially contains 12 L of pure water. A 2 g/L sugar solution is pumped in at a rate of 7 L/min. The well-mixed solution is pumped out at a rate of 5 L/min. Let m represent the mass of sugar in the tank (in grams) after t minutes. Write down a differential equation that relates m and t. **Do not solve the DE.**

2. [3 marks] Find a second linearly independent solution to the following DE, given that $y_1 = \sin x^2$ is a solution:

$y'' - \frac{1}{x}y' + 4x^2y = 0$

3. [4 marks] State y_C and y_P:

a) $y'' - 8y' + 25y = 3\sin 3x$

b) $y'' + 16y = 16\cos 4x$

4. [4 marks] Solve:

$y'' - 4y' + 4y = 0, \quad y(1) = 3e^2, \quad y'(1) = 10e^2$

5. [6 marks] Solve $y'' - 2y' - 15y = 2e^{4x} + 4x$.