

Math 252 X01
Test Two

Time: 50 minutes
Total: 18 marks

Name: _____

1. [3 marks] A large tank initially contains some sugar dissolved in 130 L of water. A 12 g/L sugar solution is pumped in at a rate of 2 L/min. The well-mixed solution is pumped out at a rate of 3 L/min. After one hour there is 1.2 kg of sugar in the tank.

Let A represent the number of grams of sugar in the tank after t minutes. Set up the DE and include any initial conditions. **Do not solve the DE.**

2. [5 marks] Solve using an appropriate substitution.
Give an explicit solution (solve for y).

$$\frac{dy}{dx} + \frac{1}{x}y = \frac{1}{x} \frac{1}{y^2}$$

3. [5 marks] Find the general solution, given that $y_1 = x^2$ is a solution.

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

4. [5 marks] Solve $y'' + 16y = 7 \cos 4x$