Math 202-Section 11 Quiz 4

Sr. Num.: ID. Num.: Name:

Q 1: [4 points] Use the Existence and Uniqueness Theorem to find the largest interval of definition I such that the following initial value problem has a unique solution.

$$(\cot x)y'' + (\cos x)y = 4x; \qquad y(2) = 0, \quad y'(2) = 1.$$

Q 2: a) [2 points] State whether the set $\{e^x, \sinh x, \cosh x\}$ is linearly independent on $I = (-\infty, \infty)$.

b) [4 points] Given that $y_1 = x$, $y_2 = x^{-2}$, $y_3 = x^{-2}\ln x$ are solutions of the differential equation:

$$x^3y''' + 6x^2y'' + 4xy' - 4y = 0 \quad in \quad I = (0, \infty).$$

Show that $\{y_1, y_2, y_3\}$ is a fundamental set of solutions for the differential equation.

Q 3: Given that

$$y = \frac{c_1}{x} + \frac{1}{15}x^2 - \frac{1}{6}$$

is a one-parameter family of solutions of the nonhomogeneous differential equation:

$$2x^2\frac{d^2y}{dx^2} + 5x\frac{dy}{dx} + y \;\; = \;\; x^2 - x.$$

- (2 points) Find a particular solution of the DE.

- (4 points) Find a complementary solution of the DE. (Hint: use Reduction of Order formula).

- (2 points) Find the general solution of the DE.

Q4 [2 points]: List two suggestions to make our math class better. Also, list two things that you like about your math class.