King Fahd University of Petroleum and Minerals
Quiz 3 Math 202-131 Duration 25 minutes

Full Name:
ID:
Serial number:

Question 1. Use the existence and uniqueness theorem to find the largest interval of definition I such that the IVP

$$\begin{cases} (\cot x)\, y'' + (\cos x)\, y & = 4x \\ y(2) = 0 \quad \text{and} \quad y'(2) & = 1 \end{cases}$$

has a unique solution.

Question 2. Determine whether the functions $f_1(x) = \mathrm{e}^x$, $f_2(x) = \sinh x$ and $f_3(x) = \cosh x$ are linearly independent or linearly dependent on $(-\infty, \infty)$.

Question 3. Given that $y_1 = x$, $y_2 = x^2$ and $y_3 = x^2 \ln x$ are solutions of the homogeneous DE:

$$x^3y''' - 2x^2y'' + 4xy' - 4y = 0 \quad \text{on} \quad (0,\infty).$$

Find the general solution of this DE (justify your answer).

Question 4. The function $y_1 = x$ is a solution of $x^2y'' + xy' - y = 0$ on $(0,\infty)$. Use Reduction of Order method to find the general solution of this DE.