Math 240 - Quiz 5

Name _____

September 28, 2023

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (3 points) Consider the equation $yy'' = 6x^4$. Show that $y(x) = x^3$ is a solution, and show that $y(x) = 2x^3$ is NOT a solution. Why is a linear combination of solutions NOT a solution?

2. (3 points) Suppose a and b are real numbers with $a \neq b$. Compute the Wronskian of $y_1(x) = e^{ax}$ and $y_2(x) = e^{bx}$.

3. (2 points) It is easy to verify (don't bother) that $y_1(x) = 1$ and $y_2(x) = e^x$ are solutions of $y'' - y' = 0$. Find another solution.

4. (2 points) It is easy to verify (don't bother) that $y_1(x) = x^2$ and $y_2(x) = x^3$ are two **different**, linearly independent solutions of the initial value problem

$$x^2y'' - 4xy' + 6y = 0; \quad y(0) = 0,\, y'(0) = 0.$$

Explain why does this not contradict our existence/uniqueness theorem for linear equations?