

MAT 2384-Practice Problems on independence of solutions of ODEs and the Wronskian

Question 1 For each of the following higher order ODEs, use the **Wronskian** to show that the given functions form a basis of solutions.

1. $y^{(4)} = 0$, $1, x, x^2, x^3$
2. $x^2 y''' - 3xy'' + 3y' = 0$, $1, x^2, x^4$
3. $y''' - 3y'' + 3y' - y = 0$, e^x, xe^x, x^2e^x
4. $y^{(4)} + 9y'' = 0$, $1, x, \cos 3x, \sin 3x$

Question 2 Determine if the given functions are linearly independent or dependent on the positive x -axis.

1. $1, e^x, e^{-x}$
2. $\ln x, \ln(x^2), (\ln x)^2$
3. $\sin 2x, \sin x, \cos x$
4. $\cos^2 x, \sin^2 x, \cos 2x$