

**MAT 2384-Practice Problems on higher order homogeneous ODEs**

**Question 1** Find an ODE for which the given functions form a basis of solutions.

1.  $e^x, e^{2x}, e^{3x}$
2.  $e^x, e^{-x}, \cos x, \sin x$
3.  $1, x, \cos 2x, \sin 2x$

**Question 2** Solve the given ODE.

1.  $y''' + y' = 0$
2.  $y''' + y'' - y' - y = 0$
3.  $y^{(4)} - 29y'' + 100y = 0, y(0) = -1, y'(0) = 1, y''(0) = 2, y'''(0) = -1$
4.  $y^{(4)} - 9y'' - 400y = 0, y(0) = 0, y'(0) = 0, y''(0) = 41, y'''(0) = 0$
5.  $y^{(4)} + 4y = 0, y(0) = \frac{1}{2}, y'(0) = -\frac{3}{2}, y''(0) = \frac{5}{2}, y'''(0) = -\frac{7}{2}$