

MAT 239 (Differential Equations), Prof. Swift
Worksheet 27, Systems of First Order ODEs

1. Let $A = \begin{bmatrix} 4 \\ 5 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 2 & 0 \\ 1 & 3 \end{bmatrix}$. Is AB defined? Is BA defined? Compute the matrix product that is defined.
2. Write $y'' + \frac{1}{Q}y' + y = \cos(\omega t)$ as a system of 2 first order ODEs for the position y and velocity v .
3. Write the system you found in problem 2 as a single matrix ODE $\frac{d}{dt}\mathbf{x} = A\mathbf{x} + \mathbf{g}(t)$. Start by defining the vector $\mathbf{x} = \begin{bmatrix} y \\ v \end{bmatrix}$.