

Worked Out Homework 1
MA 303 Fall 2011 (Aaron N. K. Yip)
Friday, Sept. 2, in class

1. (a) Do Textbook (Boyce-DiPrima, 9th-ed.) section 3.3, page 165, #34 (on Euler Equation)
- (b) Use the above result to find the *general solutions* $y(t)$ of the the following differential equations:
 - i. $t^2y'' + ty' + y = 0$
 - ii. $t^2y'' + 4ty' + 2y = 0$
 - iii. $t^2y'' - 3ty' - 6y = 0$
 - iv. $t^2y'' - ty' + 5y = 0$
 - v. $t^2y'' + 3ty' + y = 0$
 - vi. $t^2y'' - 3ty' + 4y = 0$

2. Find the eigenvalues and eigenvectors of the following matrices:

$$A = \begin{pmatrix} 3 & 1 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} 3 & 1 & 0 \\ 0 & 3 & 1 \\ 0 & 0 & 3 \end{pmatrix}, \quad C = \begin{pmatrix} 3 & 0 & 0 \\ 0 & 3 & 1 \\ 0 & 0 & 2 \end{pmatrix}, \quad D = \begin{pmatrix} 3 & 1 & 2 \\ 0 & 3 & 3 \\ 0 & 0 & 2 \end{pmatrix}$$

In each case and for each eigenvalue, determine the algebraic multiplicity (i.e. the number of times the eigenvalue repeats) and the geometric multiplicity (i.e. the number of linearly independent eigenvectors).