

**MA2327, Homework #3**  
due Thursday, Nov. 17 or Nov. 24

1. Compute the matrix exponential  $e^{tA}$  in the case that  $A = \begin{bmatrix} 2 & -1 \\ 4 & 6 \end{bmatrix}$ .
2. Compute the matrix exponential  $e^{tA}$  in the case that  $A = \begin{bmatrix} 3 & 1 \\ -2 & 1 \end{bmatrix}$ .
3. Find the unique solution of the initial value problem

$$y'''(t) - 4y''(t) - 3y'(t) + 18y(t) = 0, \quad y(0) = y'(0) = 0, \quad y''(0) = 25.$$

4. The method of integrating factors can also be used to solve linear systems such as

$$\mathbf{y}'(t) + f'(t)\mathbf{y}(t) = A\mathbf{y}(t), \quad A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}.$$

Solve this system explicitly by letting  $\mathbf{z}(t) = e^{f(t)}\mathbf{y}(t)$ . Hint: show that  $\mathbf{z}'(t) = A\mathbf{z}(t)$ .