

Wednesday, November 29. Nothing accepted after Thursday, November 30. This is worth 5 points. 100% points off for being late. You must work by yourself. Put your names on each sheet.

Q1/ Consider the following system of linear differential equations

$$\dot{x} = \begin{pmatrix} 6 & 5 \\ 2 & -3 \end{pmatrix} x.$$

Find the special fundamental matrix $\psi(t)$ which satisfies $\psi(0) = I$.

Q2/ Show that for any matrix B , we have $B e^B = e^B B$.

Q3/ Check whether the following functions satisfy the Lipschitz condition on the respective intervals. If so, find a suitable Lipschitz constant.

1. $f(t, x) = 2tx^{-4}$, $(t, x) \in [0, \infty] \times [1, \infty]$.
2. $f(t, y) = \cos(t) + y^3$, $t \in [0, 1], |y| \leq \infty$.