Fall
2006

HW1. Math 266B

Handout: Friday Oct 6, ~~2006~~

Due : Friday Oct 13

1. For f as in the Picard Theorem, show that

$$x' = f(x,t) \qquad x(0) = x_0$$

is equivalent to

$$x(t) = x_0 + \int_0^t f(x(s), s)\, ds .$$

2. For the matrix $A = \begin{pmatrix} 1 & 3 \\ 3 & 1 \end{pmatrix}$

(i) Find the eigenvalues λ_1, λ_2 and eigenvectors v_1, v_2.

(ii) Find U and Λ (orthogonal and diagonal matrices) for which

$$A = U \Lambda U^+$$

(iii) Find e^A

(iv) Find the solution to

$$x' = Ax$$

$$x(0) = \begin{pmatrix} 1 \\ 1 \end{pmatrix}.$$

3. For the ODE

$$\frac{d}{dt} X = X^2$$

$$X(0) = \lambda$$

find an ODE for $X_\lambda = \frac{\partial}{\partial \lambda} X$ and its solution.