

Practice for Quiz 9

These are sample problems similar to what you might find on the quiz. The quiz itself will be made up of only 2 questions.

Instructions: *Show all of your work. Answers without sufficient justification will receive little or no credit.*

1. Let A be the matrix

$$\begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & 1 \\ 1 & 1 & 2 \end{pmatrix}$$

(a) Compute $\det(A)$

(b) Find all solutions for

$$A\mathbf{x} = \begin{pmatrix} 3 \\ 1 \\ 3 \end{pmatrix}$$

(c) Find all solutions for

$$A\mathbf{x} = \begin{pmatrix} 3 \\ 0 \\ 3 \end{pmatrix}$$

2. Write the following systems of differential equations in normal form $\mathbf{x}' = A\mathbf{x} + \mathbf{f}$

(a)

$$\begin{aligned} \frac{dy}{dt} &= x + y + t \\ \frac{dx}{dt} + y &= t^2 \end{aligned}$$

(b)

$$\frac{d^3y}{dt^3} - \frac{dy}{dt} + e^t y = t + 1$$

3. Compute the eigenvalues, eigenvectors, and inverses for the following matrices (without using maple)

(a)

$$\begin{pmatrix} 3 & 2 \\ 1 & 2 \end{pmatrix}$$

(b)

$$\begin{pmatrix} 2 & -2 \\ -1 & 3 \end{pmatrix}$$

(c)

$$\begin{pmatrix} 3 & 6 \\ 1 & 2 \end{pmatrix}$$

4. Find a fundamental matrix $X(t)$ for the system $\mathbf{x}' = \mathbf{A}\mathbf{x}$ for each A

(a)

$$A = \begin{pmatrix} 1 & 5 \\ 0 & 2 \end{pmatrix}$$

(b)

$$A = \begin{pmatrix} 2 & -5 \\ 0 & 1 \end{pmatrix}$$

(c)

$$A = \begin{pmatrix} 2 & 0 \\ 0 & 2 \end{pmatrix}$$

(d)

$$A = \begin{pmatrix} 2 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$