

MA 341-001 TEST 3 REVIEW QUESTIONS

S. SCHECTER

- (1) Solving a system of linear equations: Sec. 9.2 problems 6, 8.
- (2) Matrix algebra: Sec. 9.3 problem 12.
- (3) Linear systems: Sec. 9.4 problem 24. Also verify that the given solutions are linearly independent
- (4) Real eigenvalues: Sec. 9.5 problems 14 and 22.
- (5) Complex eigenvalues: Sec. 9.6 problems 2 and 14a.
- (6) Nonhomogeneous linear systems: Sec. 9.7 problem 16.
- (7) Phase plane: Sec. 5.4 sorry, no additional problems; sec. 12.2 problem 4 (classify the origin as an attracting or repelling node, attracting or repelling spiral, or saddle; use eigenvalues and eigenvectors to sketch the phase plane).

Answers:

(1) 9.2 problem 6: $x_1 = -s/4, x_2 = s/4, x_3 = s.$

(2) 9.2 problem 8: $x_1 = -s + t, x_2 = s, x_3 = t.$

(3) 9.3 problem 12:
$$\begin{pmatrix} 1 & 0 & -1 \\ 1 & -1 & 2 \\ -1 & 1 & -1 \end{pmatrix}$$

(4) 9.4 problem 24: $c_1 \begin{pmatrix} e^{3t} \\ 0 \\ e^{3t} \end{pmatrix} + c_2 \begin{pmatrix} -e^{3t} \\ e^{3t} \\ 0 \end{pmatrix} + c_3 \begin{pmatrix} -e^{-3t} \\ -e^{-3t} \\ e^{-3t} \end{pmatrix} + \begin{pmatrix} 5t + 1 \\ 2t \\ 4t + 2 \end{pmatrix}$

(5) 9.5 problems 14: $c_1 e^{-t} \begin{pmatrix} -1 \\ 0 \\ 1 \end{pmatrix} + c_2 e^{-2t} \begin{pmatrix} 1 \\ -1 \\ 3 \end{pmatrix} + c_3 e^{3t} \begin{pmatrix} 1 \\ 4 \\ 3 \end{pmatrix}$

(6) 9.5 problems 22:
$$\begin{pmatrix} e^{2t} & -e^{2t} & e^t \\ 0 & e^{2t} & e^t \\ e^{2t} & 0 & 3e^t \end{pmatrix}$$

(7) 9.6 problem 2: $c_1 \begin{pmatrix} -5 \cos t \\ 2 \cos t - \sin t \end{pmatrix} + c_2 \begin{pmatrix} -5 \sin t \\ 2 \sin t + \cos t \end{pmatrix}$

(8) 9.6 problem 14a:
$$\begin{pmatrix} e^t \sin t - 2e^t \cos t \\ 2e^{2t} \\ -e^t \cos t - 2e^t \sin t \end{pmatrix}$$

(9) 9.7 problem 16: $c_1 \begin{pmatrix} \cos t \\ -\sin t \end{pmatrix} + c_2 \begin{pmatrix} \sin t \\ \cos t \end{pmatrix} + \begin{pmatrix} 4t \sin t \\ 4t \cos t - 4 \sin t \end{pmatrix}$

(10) 12.2 problem 4: repelling node.