MA 341H-040 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).

Date: November 13, 2007.

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.