MATH 1210 Techniques of Classical and Linear Algebra Exam Answers 2007 6 12

1a. $8\sqrt{2} - 8\sqrt{2}i$.

b. Equation $P(x) = 0$ has 3 or 1 positive real roots, 1 negative real root.

c. det $A = 7$. $A^{-1} = \begin{bmatrix} 4/7 & -5/7 \\ -1/7 & 3/7 \end{bmatrix}$.

d. T has 4 eigenvalues, all real.

e. $3\sqrt{2}(\cos \frac{-\pi}{4} + i \sin \frac{-\pi}{4})$.

f. $-5 - 26i$.

g. $\sum_{i=1}^{8} (-1)^{i+1}(2i - 1)$.

h. Linearly independent since $\det \begin{bmatrix} 1 & 2 & -1 \\ 1 & 3 & 2 \\ 0 & 4 & 6 \end{bmatrix} = -6 \neq 0$.

i. 1677.

j. $\begin{bmatrix} -2 & 5 \\ -4 & 3 \\ -2 & 7 \end{bmatrix}$.

k. Linearly dependent: too many in two dimensions.

l. $-686 + 686i$.

3. $2e^{\pi i/4}$, $2e^{11\pi i/12}$, $2e^{-5\pi i/12}$.

4. $3, 1 \pm 2i$.

5. $x = 1$, $y = 3$, $z = -2$.

6. $A^{-1} = \begin{bmatrix} 18 & -7 & 2 \\ -7 & 3 & -1 \\ 4 & -2 & 1 \end{bmatrix}$; $\mathbf{x} = \begin{bmatrix} 31 \\ -13 \\ 9 \end{bmatrix}$.

7. Corresponding to $\lambda = 6$ is $\mathbf{u} = r \begin{bmatrix} -7/4 \\ -3/4 \\ 1 \end{bmatrix}$ $(\mathbf{u} \neq \mathbf{0})$, and corresponding to $\lambda = -1$ is $\mathbf{v} = s \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} + t \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$ $(\mathbf{v} \neq \mathbf{0})$.