Math 1210: 2008 Exam Answers

1. (a) 4, 2, or 0 positive roots; 1 negative root.
   (b) $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 9 \\ 3 \\ -7 \end{bmatrix} + s \begin{bmatrix} 5 \\ 1 \\ -1 \end{bmatrix}$.
   (c) $\begin{bmatrix} -7/2 & 2 \\ -3/2 & 1 \end{bmatrix}$.
   (d) Linearly dependent because there are too many to be independent.
   (e) $8\left(\cos\frac{5\pi}{6} + i\sin\frac{5\pi}{6}\right)$.
   (f) $18i - 18$.
   (g) $\sum_{i=1}^{9}(-1)^i i^2$.
   (h) $\begin{bmatrix} 0 & 7 \\ -16 & -6 \\ 4 & 5 \end{bmatrix}$.
   (i) $(-9, -5, 8)$.
   (j) Linearly dependent.
   (k) 4096.
3. $x = 17/5$; $y = -6/5$.
4. (a) $\begin{bmatrix} -3 & 7 & 18 \\ 0 & 1 & 2 \\ -1 & 3 & 7 \end{bmatrix}$.
   (b) $\begin{bmatrix} 89 \\ 10 \\ 35 \end{bmatrix}$.
5. Corresponding to the double root 2 are the eigenvectors $s \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} + t \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix}$, where s and t are not both zero. Corresponding to the root 3 are the eigenvectors $r \begin{bmatrix} -4 \\ 3 \\ 4 \end{bmatrix}$, where $r \neq 0$.