

Test 2

Question 1. (10 marks)Given that A is a 3×3 matrix and

$$B = \begin{bmatrix} 1 & -4 & 0 \\ 2 & 1 & 4 \end{bmatrix} \quad C = \begin{bmatrix} -1 & 2 \\ -3 & 1 \end{bmatrix} \quad D = \begin{bmatrix} 5 & -2 & -1 \\ 0 & 1 & 3 \end{bmatrix} \quad E = \begin{bmatrix} 2 & 1 \\ 3 & 1 \\ 7 & -4 \end{bmatrix}$$

find the following if possible. If not possible explain why.

(a) CD (b) $\frac{1}{2}E(C-D)$

(c) $DE - \frac{1}{3}C$

(d) $A^{-1}AEB$

(d) $C^{-1}B$

Question 2. (5 marks) An alloy used in electrical transformers contains nickel (Ni), Iron (Fe) and Molybdenum (Mo). The percent of Ni is 1% less than five times the percent of Fe. The percent of Fe is 1% more than three times the percent of Mo. Find the percent of each in the alloy.

Question 3. (6 marks) Solve for x and y :

$$\begin{bmatrix} x+2y \\ 3x+5y \end{bmatrix} = \begin{bmatrix} -2 & 4 \\ 0 & 6 \end{bmatrix} \begin{bmatrix} 1 \\ 4 \end{bmatrix}$$

Question 4. (8 marks)

(a) Find the inverse of the following matrix:

$$\begin{bmatrix} 1 & 2 & -1 \\ 3 & 7 & -5 \\ -1 & -2 & 0 \end{bmatrix}$$

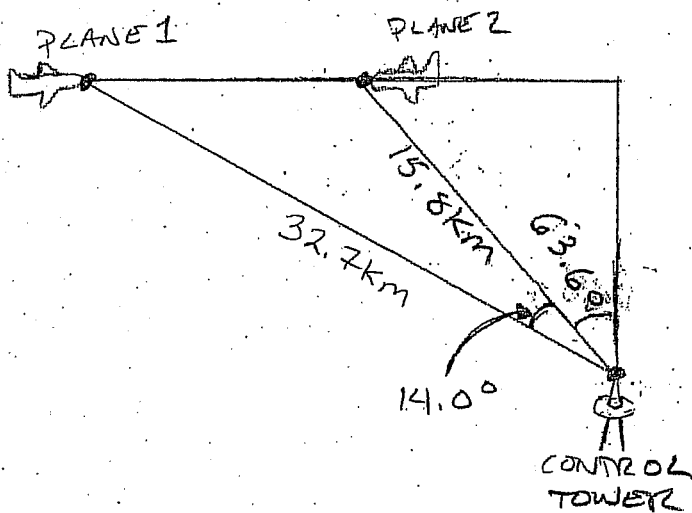
(b) Write the following system as a matrix equation and use part (a) to solve the system:

$$\begin{array}{rclcl} x & + & 2y & - & z & = & 1 \\ 3x & + & 7y & - & 5z & = & -3 \\ -x & - & 2y & & & = & 2 \end{array}$$

Question 5. (4 marks) Determine whether or not $A = B^{-1}$ (justify your answer)

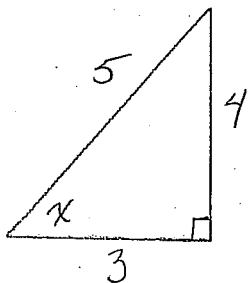
$$A = \begin{bmatrix} 1/2 & 3/4 \\ 3/2 & -1/2 \end{bmatrix} \quad B = \begin{bmatrix} 1 & -2 \\ 3 & -6 \end{bmatrix}$$

Question 6. (6 marks) An air traffic controller sights two planes that are due east from the control tower and headed toward each other. One is 15.8km from the tower and the other is 32.7km from the tower as in the diagram below. How far apart are the planes?



Question 7. (7 marks)

(a) Given the following find $\sec x$, $\csc x$ and $\cot x$:



(b) Given $\cos \theta = -12/13$ and θ is in the third quadrant use the appropriate right triangle to find $\sin \theta$, $\tan \theta$ and $\sec \theta$.

Question 8. (6 marks) Find θ for $0^\circ \leq \theta \leq 360^\circ$ (Round correctly):

(a) $\cos \theta = -0.737$

(b) $\sin \theta = -0.3040$ and $\tan \theta > 0$

Bonus. (2 marks) Solve for x :

$$\begin{vmatrix} 3 & 0 & -1 \\ 1 & x & 2 \\ 1 & 2 & x+1 \end{vmatrix} = \begin{vmatrix} 2 & x \\ -1 & x+2 \end{vmatrix}$$