IBHL Matrix problems to ponder **ibhlmorematrix.doc**

Non-calculator problems

Consider the following matrices:

$$A=\begin{pmatrix}2 & 5 & 1\\ 0 & -3 & 2\\ 7 & 0 & -1\end{pmatrix},\quad B=\begin{pmatrix}m & -2\\ 3m & -1\\ 2 & 3\end{pmatrix},\quad C=\begin{pmatrix}x-1 & 5 & y\\ 0 & -x & y+1\\ 2x+y & x-3y & 2y-x\end{pmatrix}$$

(a) **Find** $A+C$

(b) **Find** AB

(c) **Find** BA

(d) **Solve for** x **and** y **if** $A=C$

(e) **Find** $B+C$

(f) **Solve for** m **if** $3B+2\begin{pmatrix}-1 & m^2\\ -5 & 2\\ 1 & -1\end{pmatrix}=\begin{pmatrix}7 & 12\\ 17 & 1\\ 2m+2 & 7\end{pmatrix}$

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Solve for x **and** y **such that** $AB=BA$ **if** $A=\begin{pmatrix}2 & 3\\ 4 & 1\end{pmatrix}$ **and** $B=\begin{pmatrix}x & 2\\ y & 3\end{pmatrix}$

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Find the value(s) of m **so that the matrix** $\begin{pmatrix}1 & m & 1\\ 3 & 1-m & 2\\ m & -3 & m-1\end{pmatrix}$

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The matrices A, B **are such that** $\det A=\det B$ **where** $A=\begin{pmatrix}1 & -3\\ x+1 & 5\end{pmatrix}$ **and**

$$B=\begin{pmatrix}1 & x & -2\\ -2 & 1 & 0\\ 0 & -1 & x\end{pmatrix}.$$

Find the values of x

Calculator

Given that $A = \begin{pmatrix} 2 & 3 \\ 1 & -2 \end{pmatrix}$ **and** $B = \begin{pmatrix} 2 & 0 \\ 0 & -3 \end{pmatrix}$**, find** X **if** $BX = A - AB$

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2006 TZ0 Paper 2 Question 5

Consider the system of equations $T \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 4 \\ -2 \\ -42 \end{pmatrix}$ **where** $T = \begin{pmatrix} -1 & 3 & 0 \\ 0 & 2 & r \\ 3r & 0 & s \end{pmatrix}$

(a) **Find the solution of the system when** $r = 0$ **and** $s = 3$

(b) **The solution of the system is not unique**

(i) **Show that** $s = \frac{9}{2} r^2$

(ii) **When** $r = 2$ **and** $s = 18$**, show that the system can be solved, and find the general solution [To make it easy to check, let** $z = t$ **when writing your general solution. Hint: You'll need the Gauss-Jordan elimination method]**

(c) **Use mathematical induction [our favorite] to prove that when** $r = 0$

$$T^n = \begin{pmatrix} (-1)^n & 2^n - (-1)^n & 0 \\ 0 & 2^n & 0 \\ 0 & 0 & s^n \end{pmatrix}$$ **where** $n \in Z^+$