#First Computer Lab
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$2+2;$

$$4 \tag{1}$$

$3\cdot 5;$

$$15 \tag{2}$$

$$\frac{3^6 \cdot 5}{2}$$

$$\frac{3645}{2} \tag{3}$$

$7\cdot(9+11):$
$7\cdot(9+11);$

$$140 \tag{4}$$

$x+2;$

$$x+2 \tag{5}$$

$x := 2;$

$$2 \tag{6}$$

$x+2;$

$$4 \tag{7}$$

$v := \langle 1, 2, 3\rangle;$

$$\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \tag{8}$$

$w := \langle 1, 0, 0\rangle;$

$$\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} \tag{9}$$

$v.w;$

$$1 \tag{10}$$

$w.w;$

$$1 \tag{11}$$

$M := \langle v|w|\langle 1, 1, 0\rangle\rangle;$

$$\begin{bmatrix} 1 & 1 & 1 \\ 2 & 0 & 1 \\ 3 & 0 & 0 \end{bmatrix} \tag{12}$$

$M.M;$

$$\begin{bmatrix} 6 & 1 & 2 \\ 5 & 2 & 2 \\ 3 & 3 & 3 \end{bmatrix} \tag{13}$$

$M.v;$

$$\begin{bmatrix} 6 \\ 5 \\ 3 \end{bmatrix} \tag{14}$$

$N := \langle\langle 1, 2, 3, 4\rangle | \langle 5, 6, 7, 8\rangle | \langle 9, 10, 11, 12\rangle\rangle;$

$$\begin{bmatrix} 1 & 5 & 9 \\ 2 & 6 & 10 \\ 3 & 7 & 11 \\ 4 & 8 & 12 \end{bmatrix} \tag{15}$$

$N.M;$

$$\begin{bmatrix} 38 & 1 & 6 \\ 44 & 2 & 8 \\ 50 & 3 & 10 \\ 56 & 4 & 12 \end{bmatrix} \tag{16}$$

$M.N;$

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Error, (in LinearAlgebra:-MatrixMatrixMultiply) first matrix
column dimension (3) <> second matrix row dimension (4)
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$P := Matrix([[1, 2, 3], [4, 5, 6], [7, 8, 9]]);$

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix} \tag{17}$$

$2 \cdot P;$

$$\begin{bmatrix} 2 & 4 & 6 \\ 8 & 10 & 12 \\ 14 & 16 & 18 \end{bmatrix} \tag{18}$$

$P - M;$

$$\begin{bmatrix} 0 & 1 & 2 \\ 2 & 5 & 5 \\ 4 & 8 & 9 \end{bmatrix} \tag{19}$$

$5 \cdot P - 3 \cdot M;$

$$\begin{bmatrix} 2 & 7 & 12 \\ 14 & 25 & 27 \\ 26 & 40 & 45 \end{bmatrix} \tag{20}$$

$2 + 2;$

$$4 \tag{21}$$

$4+7;$

$$11 \tag{22}$$

$\%;$

$$11 \tag{23}$$

$\%\%\%;$

$$4 \tag{24}$$

$\%\%;$

$$11 \tag{25}$$

$A := Matrix([[a[1,1], a[1,2]], [a[2,1], a[2,2]]]);$

$$\begin{bmatrix} a_{1,1} & a_{1,2} \\ a_{2,1} & a_{2,2} \end{bmatrix} \tag{26}$$

$B := Matrix([[b[1,1], b[1,2]], [b[2,1], b[2,2]]]);$

$$\begin{bmatrix} b_{1,1} & b_{1,2} \\ b_{2,1} & b_{2,2} \end{bmatrix} \tag{27}$$

$C := Matrix([[c[1,1], c[1,2]], [c[2,1], c[2,2]]]);$

$$\begin{bmatrix} c_{1,1} & c_{1,2} \\ c_{2,1} & c_{2,2} \end{bmatrix} \tag{28}$$

$(A.B).C - A.(B.C);$

$$\begin{aligned} &[[(a_{1,1}b_{1,1}+a_{1,2}b_{2,1})\,c_{1,1}+(a_{1,1}b_{1,2}+a_{1,2}b_{2,2})\,c_{2,1}-a_{1,1}(b_{1,1}c_{1,1}+b_{1,2}c_{2,1}) \\ &\quad -a_{1,2}(b_{2,1}c_{1,1}+b_{2,2}c_{2,1}),(a_{1,1}b_{1,1}+a_{1,2}b_{2,1})\,c_{1,2}+(a_{1,1}b_{1,2}+a_{1,2}b_{2,2})\,c_{2,2} \\ &\quad -a_{1,1}(b_{1,1}c_{1,2}+b_{1,2}c_{2,2})-a_{1,2}(b_{2,1}c_{1,2}+b_{2,2}c_{2,2})], \\ &\quad [(a_{2,1}b_{1,1}+a_{2,2}b_{2,1})\,c_{1,1}+(a_{2,1}b_{1,2}+a_{2,2}b_{2,2})\,c_{2,1}-a_{2,1}(b_{1,1}c_{1,1}+b_{1,2}c_{2,1}) \\ &\quad -a_{2,2}(b_{2,1}c_{1,1}+b_{2,2}c_{2,1}),(a_{2,1}b_{1,1}+a_{2,2}b_{2,1})\,c_{1,2}+(a_{2,1}b_{1,2}+a_{2,2}b_{2,2})\,c_{2,2} \\ &\quad -a_{2,1}(b_{1,1}c_{1,2}+b_{1,2}c_{2,2})-a_{2,2}(b_{2,1}c_{1,2}+b_{2,2}c_{2,2})]] \end{aligned} \tag{29}$$

$simplify(\%);$

$$\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} \tag{30}$$

$Q := Matrix([[5,3],[3,2]]);$

$$\begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix} \tag{31}$$

$Q^{(-1)};$

$$\begin{bmatrix} 2 & -3 \\ -3 & 5 \end{bmatrix} \tag{32}$$

$\frac{1}{Q};$

$$\begin{bmatrix} 2 & -3 \\ -3 & 5 \end{bmatrix} \tag{33}$$

$R := Q^{(-1)};$

$$\begin{bmatrix} 2 & -3 \\ -3 & 5 \end{bmatrix} \tag{34}$$

$Q.R;$

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \tag{35}$$

$T := Matrix([[1, 2, 3], [2, 5, 2], [6, -3, 1]]);$

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 2 \\ 6 & -3 & 1 \end{bmatrix} \tag{36}$$

$\frac{1}{T};$

$$\begin{bmatrix} -\frac{1}{7} & \frac{1}{7} & \frac{1}{7} \\ -\frac{10}{77} & \frac{17}{77} & -\frac{4}{77} \\ \frac{36}{77} & -\frac{15}{77} & -\frac{1}{77} \end{bmatrix} \tag{37}$$

$x := \langle 0, 0, 2 \rangle;$

$$\begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} \tag{38}$$

$T.x;$

$$\begin{bmatrix} 6 \\ 4 \\ 2 \end{bmatrix} \tag{39}$$

$\left(\frac{1}{T}\right).\langle 6, 4, 2 \rangle;$

$$\begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} \tag{40}$$

5 Computer Lab Questions

Let's go back to our matrix from lecture 5:

$$\begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & 2 \\ 6 & -3 & 1 \end{pmatrix}.$$

Use Maple to answer the following:

What is the inverse of the above matrix?

$$\begin{pmatrix} -\frac{1}{7} & \frac{1}{7} & \frac{1}{7} \\ -\frac{10}{77} & \frac{17}{77} & -\frac{4}{77} \\ \frac{36}{77} & -\frac{15}{77} & -\frac{1}{77} \end{pmatrix}$$

What do we get when we left-multiply the above matrix by the column vector $\begin{pmatrix} 0 \\ 0 \\ 2 \end{pmatrix}$?

$$\begin{pmatrix} 6 \\ 4 \\ 2 \end{pmatrix}$$

What do we get when we left-multiply the inverse matrix by the column vector $\begin{pmatrix} 6 \\ 4 \\ 2 \end{pmatrix}$?

$$\begin{pmatrix} 0 \\ 0 \\ 2 \end{pmatrix}$$