

MTH 3331 Test #1

SUMMER 2013

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Name _____

Instructions. Show clearly how you arrive at your answers.

1. Given

$$A = \begin{bmatrix} 2 & 1 & \frac{1}{2} \\ \frac{1}{2} & 1 & 0 \\ 3 & 1 & \frac{1}{2} \end{bmatrix} \quad B = \begin{bmatrix} -1 & 0 & 1 \\ 2 & 1 & -\frac{1}{2} \\ 5 & -2 & 3 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 1 \\ 2 & 1 \\ 0 & 4 \end{bmatrix}$$

$$D = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \quad E = \begin{bmatrix} -1 & 1 & 0 \\ 1 & -1 & 1 \\ 0 & 1 & -1 \end{bmatrix} \quad F = \begin{bmatrix} -2 & -1 & -\frac{1}{2} \\ -\frac{1}{2} & -1 & 0 \\ -3 & -1 & -\frac{1}{2} \end{bmatrix}$$

Without actually computing the following sums and products, indicate which of these can be computed and which can't.

(a) AB

(b) BC

(c) CB

(d) $C + B$

(e) $A + B$

(f) CD

(g) DC

(h) $C + D$

$$2. \quad A = \begin{bmatrix} 2 & 1 & \frac{1}{2} \\ \frac{1}{2} & 1 & 0 \\ 3 & 1 & \frac{1}{2} \end{bmatrix} \quad B = \begin{bmatrix} -1 & 0 & 1 \\ 2 & 1 & -\frac{1}{2} \\ 5 & -2 & 3 \end{bmatrix} \quad F = \begin{bmatrix} -2 & -1 & -\frac{1}{2} \\ -\frac{1}{2} & -1 & 0 \\ -3 & -1 & -\frac{1}{2} \end{bmatrix}$$

(a) Compute AB .

(b) Compute $A + F$.

3. Referring to the matrices in problem 2, compute $BA + BF$. (Hint: Think about this for a second.)

4. Write the system of equations

$$\begin{aligned} u + v - 7w &= 20 \\ 3u + 9v + 7w &= 20 \\ 4u + 4v + 4w &= 10 \end{aligned}$$

in the form: $\begin{bmatrix} & & \\ & A & \\ & & \end{bmatrix} \begin{bmatrix} u \\ v \\ w \end{bmatrix} = \begin{bmatrix} 20 \\ 20 \\ 10 \end{bmatrix}$

5. For $(n \times n)$ matrices A and B , compute $(A + B)(A - B)$, simplifying to the extent possible.

6. For

$$A = \begin{bmatrix} 7 & 6 & 3 \\ 2 & 1 & 0 \\ 9 & 8 & 5 \end{bmatrix} \quad B = \begin{bmatrix} -1 & 1 & 1 \\ 1 & -1 & 1 \\ 2 & 3 & 4 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 1 & 0 \\ 2 & 1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$

compute $3A + 2B + C$.

7. Given

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 6 \end{bmatrix} \quad B = \begin{bmatrix} 3 & 2 \\ 2 & -1 \end{bmatrix} \quad C = \begin{bmatrix} 5 & -2 \\ 1 & 1 \end{bmatrix}$$

(a) Compute AB and AC .

(b) What does the result in problem 7.a tell us about matrix multiplication?

8. Simplify to the extent possible: $[C^T \cdot (A^T + B^T)]^T =$

9. Given the vectors $\mathbf{u} = (a, b)$ and $\mathbf{v} = (c, d)$, give the geometric interpretation of the following:

(a) $\mathbf{u} + \mathbf{v}$

(b) $\mathbf{u} - \mathbf{v}$