Name: _____

Score: _____ /15

2.3

Linear Algebra Worksheet

1. Given the following matrices, evaluate the given expression. If it is not possible or does not make sense, explain why not.

$$A = \begin{pmatrix} 3 & 2 \\ -1 & 1 \end{pmatrix},\ B = \begin{pmatrix} 1 & 5 \\ -2 & 0 \end{pmatrix},\ C = \begin{pmatrix} 0 & 1 & -2 \\ -1 & 0 & 1 \end{pmatrix},\ D = \begin{pmatrix} 1 & 1 \\ -1 & 2 \\ 2 & -3 \end{pmatrix},\ E = \begin{pmatrix} 4 & 0 & 1 \\ -2 & 3 & 5 \\ 1 & -1 & 0 \end{pmatrix}$$

(a) $2A + 3B$ (b) $C + D$ (c) $\det(A)$ (d) $\det(CD)$ (e) DC

(f) $\mathrm{Tr}(E)$ (g) CE (h) CB (i) $ED + A$

a) $2A+3B$

$2\begin{pmatrix} 3 & 2 \\ -1 & 1 \end{pmatrix} + 3\begin{pmatrix} 1 & 5 \\ -2 & 0 \end{pmatrix} = \begin{pmatrix} 6 & 4 \\ -2 & 2 \end{pmatrix} + \begin{pmatrix} 3 & 15 \\ -6 & 0 \end{pmatrix} = \begin{pmatrix} 9 & 19 \\ -8 & 2 \end{pmatrix}$

b) $C+D$

this operation isn't possible since C and D have different dimensions.

c) $\det(A)$

$\det(A) = (3)(1) - (2)(-1) = 5$

d) $\det(CD)$

$CD = \begin{pmatrix} 0\cdot1+1\cdot-1+-2\cdot2 & 0\cdot1+1\cdot2+-2\cdot-3 \\ -1\cdot1+0\cdot-1+1\cdot2 & -1\cdot1+0\cdot2+1\cdot-3 \end{pmatrix} = \begin{pmatrix} -5 & -5 \\ 1 & -4 \end{pmatrix}$

$\det(CD) = (-5)(-4) - (-5)(1) = 25$

e) DC

$DC = \begin{pmatrix} (1\cdot0)+(1\cdot-1) & (1\cdot1)+(1\cdot0) & (1\cdot-2)+(1\cdot1) \\ (-1\cdot0)+(2\cdot-1) & (-1\cdot1)+(2\cdot0) & (-1\cdot-2)+(2\cdot1) \\ (2\cdot0)+(-3\cdot-1) & (2\cdot1)+(-3\cdot0) & (2\cdot-2)+(-3\cdot1) \end{pmatrix} = \begin{pmatrix} -1 & 1 & -1 \\ -2 & -1 & 4 \\ 3 & 2 & -7 \end{pmatrix}$

f) $\mathrm{Tr}(E)$

$\mathrm{Tr}(E) = 4+3+0 = 7$

g) CE

$CE = \begin{pmatrix} (0\cdot4)+(1\cdot-2)+(-2\cdot1) & (0\cdot0)+(1\cdot3)+(-2\cdot-1) & (0\cdot1)+(1\cdot5)+(-2\cdot0) \\ (-1\cdot4)+(0\cdot-2)+(1\cdot1) & (-1\cdot0)+(0\cdot3)+(1\cdot-1) & (-1\cdot1)+(0\cdot5)+(1\cdot0) \end{pmatrix} = \begin{pmatrix} -4 & 5 & 5 \\ -3 & -1 & -1 \end{pmatrix}$

h) CB

this operation is not possible

# of columns in C ≠ # of rows of B

(3 ≠ 2)

i) $ED+A$

this operation isn't possible

the dimensions of ED ≠ the dimensions of A (3x2 ≠ 2x2)