(please print neatly!)

**Directions:** Answer each of the following questions. Make sure to read the instructions for <u>each question</u> as you proceed. For multiple choice questions, indicate your choice(s) by circling/drawing a box around the appropriate selection(s).

Throughout, let

$$A = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \end{pmatrix} \qquad B = \begin{pmatrix} -1 & 2 \\ 1 & 3 \end{pmatrix} \qquad C = \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \qquad \mathbf{v} = \begin{pmatrix} 1 \\ -1 \\ 3 \end{pmatrix}.$$

$$2 \times 2$$

2 pts ca.

- 1. Compute each of the following or state that it does not exist. If it does not exist, please indicate why!
  - (a) A+C

    DNE A & C aren't the same size.

(b) 
$$B-2C$$

$$8-2C = \begin{pmatrix} -1 & 2 \\ 1 & 3 \end{pmatrix} - 2 \begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} = \begin{pmatrix} -1-2(0) & 2-2(1) \\ 1-2(1) & 3-2(0) \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ -1 & 3 \end{pmatrix}$$

(c) AB

DNE:  $\# \operatorname{Cols}(A) = 3 \neq 2 = \# \operatorname{rows}(B)$ 

(d) BA
$$BA = \begin{pmatrix} -1 & 2 \\ 1 & 3 \end{pmatrix} \begin{pmatrix} 1 & 2 & 3 \\ 6 & 1 & 1 \end{pmatrix} = \begin{pmatrix} -1(1) + 2(6) & -1(2) + 2(1) & -1(3) + 2(1) \\ 1(1) + 3(6) & 1(2) + 3(1) & 1(3) + 3(0) \end{pmatrix}$$
(e) vA
$$DNE : \# cols(\vec{V}) = 1$$

$$\neq 2 = \# cons(A)$$

(f) Av

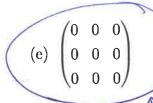
$$A^{\frac{1}{4}} = \begin{pmatrix} 1 & 2 & 3 \\ 0 & 1 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ -1 \\ 3 \end{pmatrix} = \begin{pmatrix} 1(1) + 2(-1) + 3(3) \\ 6(1) + 1(-1) + 1(3) \end{pmatrix} = \begin{pmatrix} 8 \\ 2 \end{pmatrix}$$

2. Which of the following matrices are in Row Echelon Form (REF)? Hint: There may be more than one but there may also be none!

(a) 
$$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$

$$\begin{pmatrix}
(d) & \begin{pmatrix} 1 & -1 & 0 \\ 0 & 1 & 2 \end{pmatrix}
\end{pmatrix}$$

(b) 
$$\begin{pmatrix} 0 & 0 \\ 2 & 2 \\ 0 & -5 \end{pmatrix}$$



$$\begin{array}{c|cccc}
\hline
 & (c) & \begin{pmatrix} 0 & 2 & 2 \\ 0 & 0 & 1 \end{pmatrix}
\end{array}$$

3. Which of the following matrices are in Reduced Row Echelon Form (RREF)? Hint: There may be more than one but there may also be none!

$$\begin{pmatrix}
0 & 1 \\
1 & 0
\end{pmatrix}$$

(a) 
$$\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$$
 (d)  $\begin{pmatrix} 1 & -1 & 0 \\ 0 & 1 & 2 \end{pmatrix}$ 

(b) 
$$\begin{pmatrix} 0 & 0 \\ 2 & 2 \\ 0 & -5 \end{pmatrix}$$

(c) 
$$\begin{pmatrix} 0 & 2 & 2 \\ 0 & 0 & 1 \end{pmatrix}$$

(f) 
$$\begin{pmatrix} 0 & 0 & 2 & 2 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

4. Each of the following matrices needs only **one** elementary row operation to be in RREF.

Indicate which operation is required and show the RREF matrix that results from performing that operation.

(a) 
$$\begin{pmatrix} 1 & 1 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{pmatrix} \xrightarrow{\mathbb{R}_2 \longleftrightarrow \mathbb{R}_3} \begin{pmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{pmatrix}$$

(b) 
$$\begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 2 & -2 & 1 \end{pmatrix} \xrightarrow{R_2 = \frac{1}{2} R_2} \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & -1 & \frac{1}{2} \end{pmatrix}$$

(c) 
$$\begin{pmatrix} 1 & 0 & 1 \\ -1 & 1 & -2 \end{pmatrix}$$
  $R_{2}=R_{1}+R_{2}$   $\begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & -1 \end{pmatrix}$