

Row-echelon form and rank

1. Are either of these matrices in row-echelon form?

$$\left(\begin{array}{ccc|c} 0 & 1 & 0 & 60 \\ 0 & 0 & 2 & 120 \\ -2 & 2 & 1 & 60 \end{array} \right) \text{ or } \left(\begin{array}{ccc|c} 0.3222 & 0.3413 & 0.3489 & 12.2 \\ -0.8256 & 0.8130 & 0.01 & 0 \\ 0.4632 & 0.4717 & -0.9371 & 0 \end{array} \right)$$

2. In Question 1, is it possible to rearrange the rows of these augmented matrix so that the rearrangement is in row-echelon form? If it is possible to rearrange the rows into one that is in row-echelon form, then what is the rank of the matrix, and what is the rank of the augmented matrix?

3. For each of these augmented matrix, determine if they are in row-echelon form, and if they are, what is the rank of the matrix, and what is the rank of the augmented matrix? (This question is not strictly an application question, but you need to understand the definitions.)

$$\left(\begin{array}{ccc|c} 0.3222 & 0.3413 & 0.3489 & 12.2132 \\ 0 & 0.8130 & 0.0132 & 0 \\ 0 & 0 & -0.9371 & 0 \end{array} \right)$$

$$\left(\begin{array}{ccc|c} 0.3222 & 0.3413 & 0.3489 & 12.2132 \\ 0 & 0.8130 & 0.0132 & 0 \\ 0 & 0 & -0.9371 & 0 \\ 0 & 0 & 0 & 2.4543 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{array} \right)$$

$$\left(\begin{array}{ccc|c} 0.3222 & 0.3413 & 0.3489 & 12.2132 \\ 0 & 0.8130 & 0.0132 & 0 \\ 0 & 8.2351 & -0.9371 & 0 \\ 0 & 0 & 4.5235 & 2.4543 \\ 0 & 0 & 0 & 2.3512 \\ 0 & 0 & 0 & 0 \end{array} \right)$$

$$\left(\begin{array}{cccc|c} 0.3222 & 0.3413 & 0.3489 & 12.2132 & -0.3151 \\ 0 & 0.8130 & 0.0132 & 0 & 1.2354 \\ 0 & 0 & 0 & 2.4543 & 3.5423 \\ 0 & 0 & 0 & 0 & 0 \end{array} \right)$$

$$\left(\begin{array}{cccc|c} 0.3222 & 0.3413 & 0.3489 & 12.2132 & -0.3151 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array} \right)$$

$$\left(\begin{array}{cccc|c} 0.3222 & 0.3413 & 0.3489 & 12.2132 & -0.3151 \\ 0 & 0 & 0 & 0 & 6.2324 \\ 0 & 0 & 0 & 0 & 2.3532 \\ 0 & 0 & 0 & 0 & -1.5542 \end{array} \right)$$