Eddie Price **Quiz 16 Solutions** **Spring 2018**

High score: 10; (nonzero) Low score: 1; Average score: 7.21
Letter grade estimates: **A: 10, B: 9, C+: 8, C: 5-7, C-: 4, D: 3, F: 0-2**

Problem 1 (2 Points). Find BA.

$$A = \begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix}, \qquad B = \begin{bmatrix} 3 & 2 \\ -2 & 1 \end{bmatrix}$$

Solution.

$$\begin{array}{ccc} BA & \longrightarrow & \begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix} \\ \downarrow & & \\ \begin{bmatrix} 3 & 2 \\ -2 & 1 \end{bmatrix} & & \boxed{\begin{bmatrix} 3 & 1 \\ -2 & 4 \end{bmatrix}} \end{array}$$

Problem 2 (7 Points). Find C^{-1}, if it exists.

$$C = \begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 1 \\ 2 & 1 & 2 \end{bmatrix}$$

Solution. We take $[C \mid I_3]$ and put it in RREF. There are many ways to put it in RREF, but no matter which way you do it, you will get the same result.

$$\left[\begin{array}{ccc|ccc} 2 & 1 & 1 & 1 & 0 & 0 \\ 3 & 2 & 1 & 0 & 1 & 0 \\ 2 & 1 & 2 & 0 & 0 & 1 \end{array}\right] \xrightarrow{\frac{1}{2}R_1 \mapsto R_1} \left[\begin{array}{ccc|ccc} 1 & \frac{1}{2} & \frac{1}{2} & \frac{1}{2} & 0 & 0 \\ 3 & 2 & 1 & 0 & 1 & 0 \\ 2 & 1 & 2 & 0 & 0 & 1 \end{array}\right] \xrightarrow[-2R_1+R_3 \mapsto R_3]{-3R_1+R_2 \mapsto R_2} \left[\begin{array}{ccc|ccc} 1 & \frac{1}{2} & \frac{1}{2} & \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{2} & \frac{-1}{2} & \frac{-3}{2} & 1 & 0 \\ 0 & 0 & 1 & -1 & 0 & 1 \end{array}\right]$$

$$\xrightarrow{2R_2 \mapsto R_2} \left[\begin{array}{ccc|ccc} 1 & \frac{1}{2} & \frac{1}{2} & \frac{1}{2} & 0 & 0 \\ 0 & 1 & -1 & -3 & 2 & 0 \\ 0 & 0 & 1 & -1 & 0 & 1 \end{array}\right] \xrightarrow[-\frac{1}{2}R_3+R_1 \mapsto R_1]{R_3+R_2 \mapsto R_2} \left[\begin{array}{ccc|ccc} 1 & \frac{1}{2} & 0 & 1 & 0 & \frac{-1}{2} \\ 0 & 1 & 0 & -4 & 2 & 1 \\ 0 & 0 & 1 & -1 & 0 & 1 \end{array}\right]$$

$$\xrightarrow{-\frac{1}{2}R_2+R_1 \mapsto R_1} \left[\begin{array}{ccc|ccc} 1 & 0 & 0 & 3 & -1 & -1 \\ 0 & 1 & 0 & -4 & 2 & 1 \\ 0 & 0 & 1 & -1 & 0 & 1 \end{array}\right]$$

Since this procedure terminates with $[I_3 \mid C^{-1}]$ if you can place it RREF, we have

$$\boxed{C^{-1} = \begin{bmatrix} 3 & -1 & -1 \\ -4 & 2 & 1 \\ -1 & 0 & 1 \end{bmatrix}}$$

Common Mistakes

For problem 1, many people found AB instead of BA.

For problem 1, a couple of people multiplied corresponding entries together. This is *not* how matrix multiplication works. The (i, j)-entry of BA is the dot product of row i of B and column j of A.

For problem 2, many people made computation errors in their row operations.

For problem 2, several people forgot to apply many row operations to the augmented part of the matrix, which is the whole point of the process.