

Math 166 Exam 3 Review
Sections F.1-F.4, 4.3-4.4, & 5.1-5.3

Note: This review covers the highlights of these sections. For additional practice problems, take a look at Week in Reviews 7 and 8.

1. Solve for the variables in the following equation.

$$\begin{bmatrix} 1 & -2 \\ -4 & 9 \end{bmatrix}^{-1} - 2 \begin{bmatrix} c+1 & 6 \\ 2b & a \end{bmatrix}^T = \begin{bmatrix} -1 & -5 \\ 9d & 4 \end{bmatrix} \begin{bmatrix} 3 & 0 \\ 1 & 4 \end{bmatrix}$$

2. Given the following matrices and their sizes, determine whether the matrix operations are possible or not possible. If possible, give the dimensions (order) of the resulting matrix.

$$A_{2 \times 4} \quad B_{3 \times 2} \quad C_{4 \times 3} \quad D_{3 \times 3, \text{ nonsingular}} \quad E_{2 \times 3} \quad F_{2 \times 2, \text{ singular}}$$

(a) $4AC + E$

(b) $BA + C$

(c) $A^T E - 7C$

(d) $F^{-1}A$

(e) BED^{-1}

(f) DB^T

(g) $A^{-1}F$

$A_{2 \times 4}$ $B_{3 \times 2}$ $C_{4 \times 3}$ $D_{3 \times 3}$, nonsingular $E_{2 \times 3}$ $F_{2 \times 2}$, singular

True or False:

(h) $I_2 F = F$

(i) $BI_3 = B$

(j) $DD^{-1} + D = D$

3. John and Bill are both throwing Super Bowl parties and want to order pizzas. Matrix A gives the cost of a small, medium, and large pizza at Papa John's and Pizza Hut. Matrix B gives the number of small, medium, and large pizzas that John and Bill want to order for their parties.

$$A = \begin{array}{c} \text{PJ} \quad \text{PH} \\ \text{S} \quad \begin{bmatrix} 6 & 5 \end{bmatrix} \\ \text{M} \quad \begin{bmatrix} 9 & 10 \end{bmatrix} \\ \text{L} \quad \begin{bmatrix} 12 & 13 \end{bmatrix} \end{array} \qquad B = \begin{array}{c} \text{J} \quad \text{B} \\ \text{S} \quad \begin{bmatrix} 5 & 2 \end{bmatrix} \\ \text{M} \quad \begin{bmatrix} 3 & 7 \end{bmatrix} \\ \text{L} \quad \begin{bmatrix} 6 & 9 \end{bmatrix} \end{array}$$

Which of the following matrix products gives the cost of each person's order if they ordered at each store?

• AB

• BA

• AB^T

• $B^T A$

4. Matrix X represents the number of cups of sugar and flour per serving of food I and food II. Matrix Y gives the number of servings of food I and food II needed for event A and event B.

$$X = \begin{array}{cc|cc} & & \text{Sug} & \text{Flo} \\ \text{FI} & & 3 & 7 \\ \text{FII} & & 2 & 9 \end{array} \qquad Y = \begin{array}{cc|cc} & & \text{FI} & \text{FII} \\ \text{A} & & 12 & 10 \\ \text{B} & & 6 & 11 \end{array}$$

- (a) What is the meaning of the matrix XY ?

- (b) What is the meaning of the matrix YX ?

5. Solve the following matrix equation for X .

(Assume all matrix operations are possible and that any necessary inverses exist.)

$$X - XB + E = F$$

6. Solve the following systems of equations. If there are infinitely many solutions, give a parameterized solution and a particular solution.

(a)
$$\begin{aligned} 10x - 8y &= 6 \\ -15x + 12y &= 20 \\ -25x + 20y &= 72 \end{aligned}$$