WIR: Chapter One

Section 1.1

For problems #1-#5, use matrices A, B, C, D and E defined below.

$$A = \begin{bmatrix} 1 & 0 & -y \\ 5 & x & 11 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 5 & 6 & 7 & 8 \\ 9 & 10 & 11 & 12 \end{bmatrix} \qquad C = \begin{bmatrix} u & v & 5 & 3 \\ -1 & 8 & 7 & 0 \end{bmatrix}$$

$$D = \begin{bmatrix} 5 & 0 & 4 \end{bmatrix} \qquad E = \begin{bmatrix} 8 & 0 \\ 1 & -5 \\ w & 6 \end{bmatrix}$$

(1) Find the dimensions of matrices defined in parts a-d.
   (a) B
   (b) C^T
   (c) D
   (d) $\left(E^T\right)^T$

(2) Find the value of each entry, if it exists.
   (a) b_{23}
   (b) b_{32}

(3) Find the value of each entry, if it exists.
   (a) $c_{24} + 4b_{32}$
   (b) f_{13} given $F = A + E^T$.

(4) Compute each of the matrices defined below, if such matrices are defined.
   (a) $\frac{1}{2}E$
   (b) $\frac{1}{2}E + D$
   (c) $2B - 4C$

(5) Find the values of $p, t, u,$ and v that will make $B = C$.

(6) The Bryan-College Station area has 3 different locations of Jay's restaurants; Wellborn Road, Walton Drive, and Wayfair Circle. At closing time on Thursday evening the manager at each location logged the inventory of certain items. The manager at the Wellborn Road location noted her store had 55 containers of potato salad, 60 pounds of chicken fingers, 100 loaves of Texas toast, and 75 bags of seasoned fries. The manager at the Walton Drive location noted they had 20 containers of potato salad and 65 loaves of Texas toast, but no chicken fingers or seasoned fries. The Wayfair Circle manager noted he had 95 pounds of chicken fingers and 45 bags of seasoned fries, but no containers of potato salad and no loaves of Texas toast.

(a) Create a 4×3 matrix, F, to represent the inventory of these items at closing time on Thursday at each location of Jay's restaurants. Clearly label your rows and columns of F.

(b) Let matrix D (below) be the desired amount of potato salad, chicken fingers, Texas toast, and seasoned fries for each location when it opens for business on Friday. Define matrix S as $S = D - F$. Find S and determine what this matrix represents in the context of this problem.

$$D = \begin{array}{l} \\ \text{Potato Salad} \\ \text{Chicken Fingers} \\ \text{Tx Toast} \\ \text{Seasoned Fries} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Wellborn Rd.} & \text{Walton Dr.} & \text{Wayfair Cr.} \end{array} \\ \begin{bmatrix} 100 & 75 & 88 \\ 125 & 110 & 150 \\ 160 & 125 & 135 \\ 105 & 115 & 150 \end{bmatrix} \end{array}$$

(c) There is an Aggie Football game in the area on Saturday and each store manager expects a 35% increase in the amount of each item in matrix D. Write a matrix equation that represents the amount of potato salad, chicken fingers, Texas toast, and seasoned fries each location will need to order when it opens for business on Saturday.

Section 1.2

(7) Suppose Dr. Whitfield owns a convenience store that sells gas. On Monday her store sold 1500 gallons of regular-unleaded, 1000 gallons of unleaded-plus, and 800 gallons of super-unleaded gasoline. If the price of gasoline on this day was \$2.25 for regular-unleaded, \$2.69 for unleaded-plus, and \$3.19 for super-unleaded gasoline.

(a) Write the number of gallons of gasoline sold as a ROW matrix A and the price per gallon as a COLUMN matrix B.

(b) Use A and B to find the revenue earned by selling gasoline on Thursday at Dr. Whitfield's store.

(8) Given matrices A, B, C and D below, find the resulting matrices in parts a-d, if possible.

$$A = \begin{bmatrix} 2 & 0 & -3 \\ p & x & 4w \end{bmatrix} \qquad B = \begin{bmatrix} 6 & -2 & 0 \\ 3 & 5 & 1 \end{bmatrix} \qquad C = \begin{bmatrix} 4 & -3 & 1 & 0 \end{bmatrix} \qquad D = \begin{bmatrix} 4 & -2 \\ r & 0 \\ 5 & 8 \\ 10 & 2 \end{bmatrix}$$

(a) CD

(b) AB

(c) AB^T

(d) AD

(e) DA

(9) Given $A = \begin{bmatrix} 2 & 0 & -3 \\ p & x & 4w \end{bmatrix}$, $D = \begin{bmatrix} 4 & -2 \\ r & 0 \\ 5 & 8 \\ 10 & 2 \end{bmatrix}$, and $Z = \begin{bmatrix} 2 & -2 & -16 \\ -4 & 0 & 6 \\ 30 & 8 & 1 \\ 25 & 2 & -26 \end{bmatrix}$, find the values of x, p, w, and r that satisfy the equation $DA = Z$.

Answers and Video Solutions

Click the boxed answer (also in red) to watch the video solution. You can also watch all videos by viewing the Math 140 Session 1 playlist. Closed captions are available for all videos and the speed of the videos may be adjusted inside of "Settings" or the cog in the bottom right corner.

Section 1.1

(1) (a) $\boxed{3 \times 4}$

(b) $\boxed{4 \times 2}$

(c) $\boxed{1 \times 3}$

(d) $\boxed{3 \times 2}$

(2) (a) $\boxed{7}$

(b) $\boxed{10}$

(3) (a) $\boxed{40}$

(b) $\boxed{f_13 = -y + w}$

(4) (a) $\boxed{A = \begin{bmatrix} 4 & 0 \\ \frac{1}{2} & -\frac{5}{2} \\ \frac{1}{2}w & 3 \end{bmatrix}}$

(b) Not possible, the matrix addition is not defined.

(c) $\boxed{A = \begin{bmatrix} 12-4u & 24-4v & 2t-20 & -6 \\ 2 & -16 & -14 & 2p \end{bmatrix}}$

(5) $\boxed{u = 6, v = 12, t = 5, p = 0}$

(6) (a)

$$R = \begin{array}{l} \\ \text{Potato Salad} \\ \text{Chicken Fingers} \\ \text{Tx Toast} \\ \text{Seasoned Fries} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Wellborn Rd.} & \text{Walton Dr.} & \text{Wayfair Cr.} \end{array} \\ \begin{bmatrix} 55 & 20 & 0 \\ 60 & 0 & 95 \\ 100 & 65 & 0 \\ 75 & 0 & 45 \end{bmatrix} \end{array}$$

(b)

$$S = \begin{array}{l} \\ \text{Potato Salad} \\ \text{Chicken Fingers} \\ \text{Tx Toast} \\ \text{Seasoned Fries} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Wellborn Rd.} & \text{Walton Dr.} & \text{Wayfair Cr.} \end{array} \\ \begin{bmatrix} 45 & 55 & 88 \\ 65 & 110 & 55 \\ 60 & 60 & 135 \\ 30 & 115 & 105 \end{bmatrix} \end{array}$$

Matrix S represents the amount of each item each store must order to obtain the desired amount to open on Friday.

(c) $\boxed{D + 0.35D = 1.35D}$

(7) (a)

$$A = \begin{array}{c} \\ \text{Whitfield's Store} \end{array} \begin{array}{c} \begin{array}{ccc} \text{Regular Unleaded} & \text{Unleaded Plus} & \text{Super Unleaded} \end{array} \\ \begin{bmatrix} 1500 & 1000 & 800 \end{bmatrix} \end{array}$$

$$B = \begin{array}{c} \text{Regular Unleaded} \\ \text{Unleaded Plus} \\ \text{Super Unleaded} \end{array} \begin{array}{c} \text{Dollars (\$)} \\ \begin{bmatrix} 2.25 \\ 2.69 \\ 3.19 \end{bmatrix} \end{array}$$

(b)

$$AB = \begin{array}{c} \\ \text{Whitfield's Store} \end{array} \begin{array}{c} \text{Dollars (\$)} \\ \begin{bmatrix} 8617 \end{bmatrix} \end{array}$$

(8) (a) $CD = \begin{bmatrix} 21 - 3r & 0 \end{bmatrix}$

(b) AB is not possible, the multiplication is not defined.

(c) $AB^T = \begin{bmatrix} 12 & 3 \\ 6p - 2x & 3p + 5x + 4w \end{bmatrix}$

(d) AD is not possible, the multiplication is not defined.

(e) $DA = \begin{bmatrix} 8 - 2p & -2x & 12 - 12w \\ 2r & 0 & -3r \\ 10 + 8p & 8x & 32w - 15 \\ 20 + 2p & 2x & -30 + 8w \end{bmatrix}$

(9) $x = 1, p = \dfrac{5}{2}, r = -2, w = \dfrac{1}{2}$