1   MATH 140 HOGU: Sections 1.1, 1.2, 2.1

Problem 1. The Texas A&M Aggies are selling football tickets and passes for the 2023 season. The average football game ticket (T) at Texas A&M is $152. Single-person season passes (S) sell for $350 a pass, while season passes with a guest pass (G) sell for $875 a pass.

Organize this information in a 3×1 matrix (call it P). Label each row and column of your matrix that signifies what each row and column number means.

Problem 2. Two groups of students head to Kyle Field to buy tickets and passes. Group A buys 10 tickets, 2 season passes, and 1 season passes with a guest pass. Group B buy 5 tickets, 3 season passes, and 2 season passes with a guest pass.

Organize this information in a 2×3 matrix (call it X). Label each row and column of your matrix that signifies what each row and column number means.

Problem 3. Using Problems 1 & 2, find how much each group of students paid on tickets and passes.

Problem 4. Let $A = \begin{bmatrix} -3 & b \\ y+9 & 12 \end{bmatrix}$ and let $X = \begin{bmatrix} z & 4 \\ 2 & 3 \end{bmatrix}$. Find $A - 3X$.

Problem 5. Solve the matrix equation below for A. Write your answers in fraction form.

$$-2A + 4 \begin{bmatrix} 1 & 2 & 3 \end{bmatrix} = -3 \begin{bmatrix} -1 & -2 & -3 \end{bmatrix} + 2A$$

Problem 6. Let $A = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 5 \\ -1 & 4 \end{bmatrix}$, and $C = \begin{bmatrix} 2 \\ -2 \end{bmatrix}$. If possible, compute ABC.
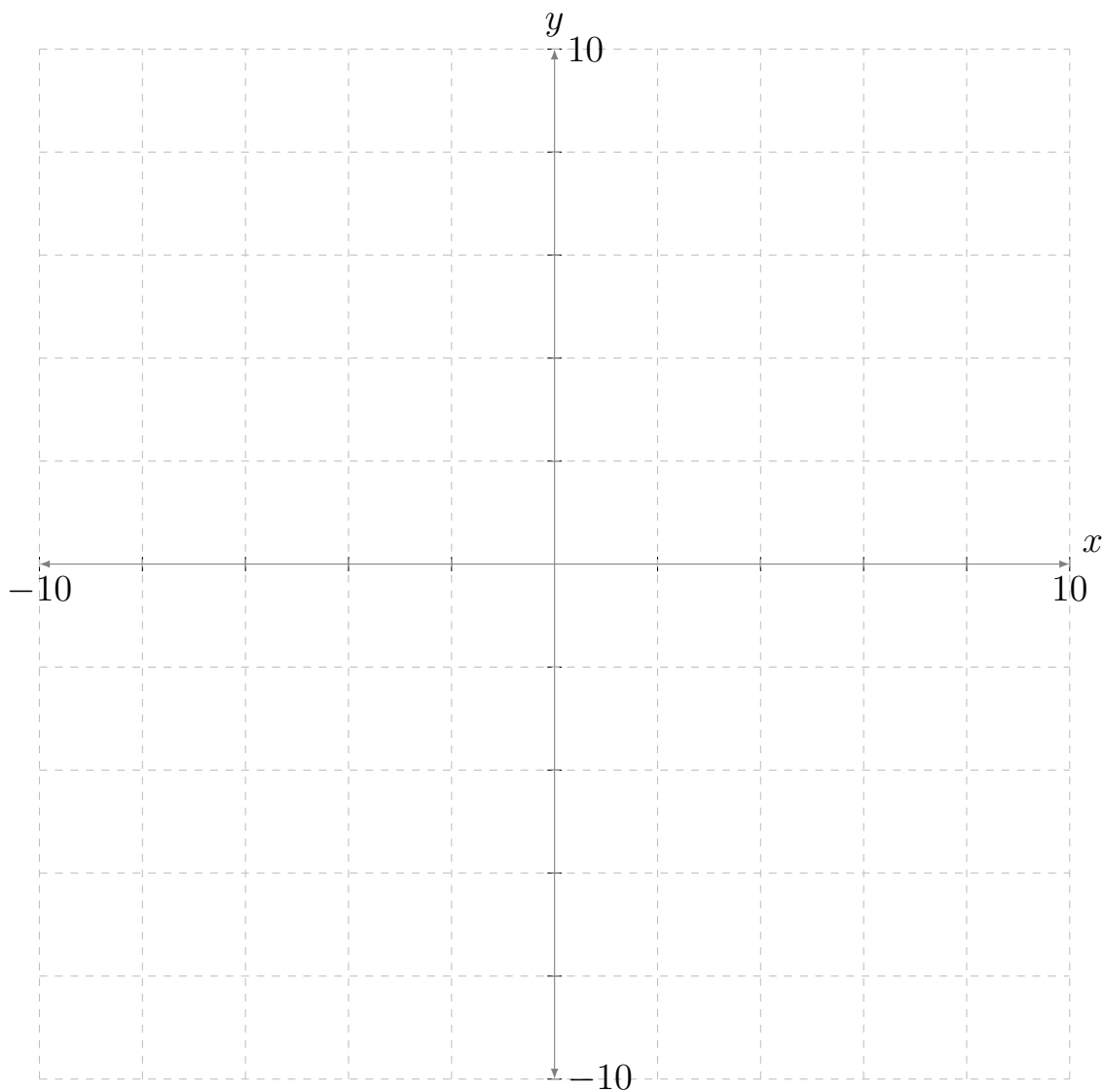
Would you get the same result by multiplying BAC?

How about when multiplying $A(BC)$ first (multiplying B and C before A) instead of $(AB)C$ (multiplying A and B before C)?

Problem 7. Fill in the table below.

Line	x- intercept	y-intercept	Slope
$-5x + 3y = 24$	(,)	(,)	
$5x + 3y = 15$	(,)	(,)	
$y = -1$	(,)	(,)	
$x = 4$	(,)	(,)	

Graph each line on the plot below. Label each line by its equation.

Problem 8. A company is selling oversized Reveille plushies. They are adorable. Use the information below to answer the following questions.

- The company has a production cost of \$55 per plushie.

- The company can produce 120 plushies for a total cost of \$7200.

- The company receives \$5760 from selling 80 plushies.

(a) Determine the cost function $C(x)$, where x is the number of plushies the company sells.

(b) Write the revenue function $R(x)$, where x is as above.

(c) Compute the profit function $P(x)$, where x is as above.

Problem 9. Consider the matrix equation below. Find the values of a, b, and c that make this equation true.

$$\begin{bmatrix} 1 & -4 \\ 0 & c+1 \end{bmatrix} + 3 \begin{bmatrix} a+2 & 0 \\ 3 & -1 \end{bmatrix}^T = \begin{bmatrix} 7 & b \\ 0 & 1 \end{bmatrix}.$$

Problem 10. Compute the size of the following matrices. If the computation isn't possible, just write "not possible" instead. Use these matrices:

$$A = \begin{bmatrix} 2 & -3 \\ 2 & 1 \\ 4 & -3 \\ -3 & 2 \end{bmatrix} \qquad B = \begin{bmatrix} 1 \\ 1 \\ -1 \end{bmatrix} \qquad C = \begin{bmatrix} 2 \\ -1 \end{bmatrix} \qquad D = \begin{bmatrix} 8 & 3 & -4 \\ 5 & 1 & 2 \end{bmatrix}$$

(a) AC

(b) BC

(c) $D^T C$

(d) DBC

Problem 11. Let $(3, -2)$ and $(8, 1)$ be two points on a line.

(a) Calculate the slope of the line. Write your answer as a reduced fraction.

(b) Write the equation of the line connecting these two points. Write your equation with fractions.

Problem 12. The top five baseball players at Texas A&M have official game batting averages (G) of .365, .325, .279, .263, and .248, respectively. However, during their practices these same five players have batting averages (P) of .355, .348, .267, .265, and .232, respectively.

(a) Organize this information in a 5×2 matrix (call it B). Label each row and column of your matrix that signifies what each row and column number means.

(b) The baseball coach gives the players a goal to raise their batting averages by 3% next year, both in official play and in practice. Find a 5×2 matrix representing the batting averages that each of these top 5 players would need to have in order to meet the coach's goal. *Round up* your answers to the nearest thousandth.