PATTERNS WITHIN SYSTEMS OF LINEAR EQUATIONS

PART A: Consider these systems of 2×2 linear equations.

System 1:
$$\begin{aligned} x+3y&=5 \\ 2x-y&=-4 \end{aligned}$$

System 2:
$$\begin{aligned} x-2y&=-5 \\ 3x+4y&=5 \end{aligned}$$

- Examine the constants in each of the above equations and describe any common patterns.
- Solve the first system of equations. Display your solution graphically. What is the significance of your solution?
- Solve the second system of equations as well as a few more systems similar to the examples above. Comment on your solutions.
- Make a **conjecture** regarding this type of 2×2 system and prove it algebraically.
- Using technology, extend your investigation to 3×3 systems whose constants exhibit the patterns seen above.
- Make a **conjecture** regarding the solution to those 3×3 systems.

PART B: Consider this 2×2 system of linear equations

$$\begin{aligned} x+2y&=4 \\ 5x-y&=\frac{1}{5} \end{aligned}$$

- Examine the constants in both equations and describe any patterns.
- Rewrite the above two equations in the form $y=ax+b$. How are the constants a and b related?
- Using technology, create a family of linear equations similar to the example shown above. On the same set of axes, display graphs of your equations. Ensure that the family of equations graphed includes several lines with a wide range of gradients.

- Closely examine the resulting graphical display. Clearly describe any apparent graphical patterns.

- Set up and solve a general 2×2 system that incorporates the patterns found above.

- Using your solution to the general system, or otherwise, provide a proof of the graphical pattern observed above.