Math 2080: Differential Equations
Worksheet 4.1: Basic matrix algebra

NAME:

Let $\boldsymbol{A} = \begin{bmatrix} -2 & 1 \\ 4 & 1 \end{bmatrix}$ and $\boldsymbol{B} = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$.

(a) Compute $\boldsymbol{A} + \boldsymbol{B}$, $\boldsymbol{AB}$, and $\boldsymbol{BA}$.

(b) Compute $\det \boldsymbol{A}$, $\det \boldsymbol{B}$, $\det(\boldsymbol{AB})$, and $\det(\boldsymbol{BA})$.

(c) Compute $\boldsymbol{A}^{-1}$. What goes wrong if you try to compute $\boldsymbol{B}^{-1}$?

(d) Write the following system of equations in matrix notation, $\boldsymbol{Ax} = \boldsymbol{b}$, and then solve for $\boldsymbol{x}$:

$$\begin{cases} -2x_1 + x_2 = 12 \\ 4x_1 + x_2 = 18 \end{cases}$$

(e) Find all solutions to $\boldsymbol{Ax} = \boldsymbol{0}$.

(f) Find a vector $\boldsymbol{v} \neq \boldsymbol{0}$ such that $\boldsymbol{Bv} = \boldsymbol{0}$.