## Math 2080: Differential Equations <br> Worksheet 4.1: Basic matrix algebra

## NAME:

Let $\boldsymbol{A}=\left[\begin{array}{cc}-2 & 1 \\ 4 & 1\end{array}\right]$ and $\boldsymbol{B}=\left[\begin{array}{ll}1 & 2 \\ 2 & 4\end{array}\right]$.
(a) Compute $\boldsymbol{A}+\boldsymbol{B}, \boldsymbol{A B}$, and $\boldsymbol{B} \boldsymbol{A}$.
(b) Compute $\operatorname{det} \boldsymbol{A}, \operatorname{det} \boldsymbol{B}, \operatorname{det}(\boldsymbol{A B})$, and $\operatorname{det}(\boldsymbol{B} \boldsymbol{A})$.
(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, $\boldsymbol{A} \boldsymbol{x}=\boldsymbol{b}$, and then solve for $\boldsymbol{x}$ :

$$
\left\{\begin{array}{r}
-2 x_{1}+x_{2}=12 \\
4 x_{1}+x_{2}=18
\end{array}\right.
$$

(e) Find all solutions to $\boldsymbol{A x}=\mathbf{0}$.
(f) Find a vector $\boldsymbol{v} \neq \mathbf{0}$ such that $\boldsymbol{B} \boldsymbol{v}=\mathbf{0}$.

