1. Consider the system of equations below, where $a$ is an unknown parameter.

\[ax + 3y = -3\]
\[4x + 6y = 6\]

(a) (6 points). Use elimination to form the upper-diagonal form of the augmented coefficient matrix for this system. Back substitute to get solutions for $x$ and $y$ in terms of the parameter $a$. What assumption(s) about $a$ do you have to make to do this?

\[
\begin{pmatrix}
a & 3 & -3 \\
4 & 6 & 6
\end{pmatrix}
\rightarrow
\begin{pmatrix}
2 & 3 & 3 \\
a & 3 & -3
\end{pmatrix}
\rightarrow
\begin{pmatrix}
2 & 3 & 3 \\
0 & 3 - \frac{3a}{2} & -3 - \frac{3a}{2}
\end{pmatrix}
\]

\[
\begin{pmatrix}
2 & 3 & 3 \\
0 & 1 & \frac{a + 2}{a - 2}
\end{pmatrix}
\leftarrow
\begin{pmatrix}
2 & 3 & 3 \\
0 & 2 - a & (2 + a)
\end{pmatrix}
\]

\[
\begin{pmatrix}
1 & 0 & \frac{6}{a - 2} \\
0 & 1 & \frac{a + 2}{a - 2}
\end{pmatrix}
\]

$a \neq 2$

\[x = \frac{6}{2 - a}\]
\[y = \frac{2}{2 - a} = -1\]

b. (2 points). If $a = 0$ how many solutions does this system have? Either find the solution(s) or explain why the system can not be solved.

If $a = 0$, $x = \frac{6}{2} = 3$
\[y = \frac{2}{-2} = -1\]

ONE SOLUTION

C. (2 points). If $a = 2$ how many solutions does this system have? Either find the solution(s) or explain why the system can not be solved.

If $a = 2$ there are NO SOLUTIONS

( The lines are parallel. )