

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?

$$\left(\begin{array}{cc|c} a & 3 & -3 \\ 4 & 6 & 6 \end{array} \right) \rightarrow \left(\begin{array}{cc|c} 2 & 3 & 3 \\ a & 3 & -3 \end{array} \right) \rightarrow \left(\begin{array}{cc|c} 2 & 3 & 3 \\ 0 & 3 - \frac{3a}{2} & -3 - \frac{3a}{2} \end{array} \right)$$

$$\left(\begin{array}{cc|c} 2 & 0 & 3 - 3\left(\frac{a+2}{a-2}\right) \\ 0 & 1 & \frac{a+2}{a-2} \end{array} \right) \leftarrow \left(\begin{array}{cc|c} 2 & 3 & 3 \\ 0 & 1 & \frac{a+2}{a-2} \end{array} \right) \leftarrow \left(\begin{array}{cc|c} 2 & 3 & 3 \\ 0 & 2-a & -(2+a) \end{array} \right)$$

$$\left(\begin{array}{cc|c} 1 & 0 & \frac{-6}{a-2} \\ 0 & 1 & \frac{a+2}{a-2} \end{array} \right)$$

$$a \neq 2$$

$$x = \frac{6}{2-a}$$

$$y = \frac{a+2}{a-2}$$

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.

$$\text{If } a=0, \quad x = \frac{6}{2} = 3$$

$$y = \frac{2}{-2} = -1$$

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.)