

Introduction to Mathematics for Political Science

Problem Set 8: Solving Systems of Equations

Due: August 9

Instructions: You are encouraged to work in groups and actively participate on the Piazza page. Submitted solutions may use a calculator for basic arithmetic, but do not search the internet for solutions. Do not use a calculator or search for solutions. Show all of your work. Submit typed solutions using the link on the course page.

1. Solve the following systems of equations using substitution.

•

$$2x + 3y = 10$$

$$2y = 4$$

•

$$3x + 5y - 2z = 1$$

$$3y + z = 8$$

$$5z = 25$$

•

$$10x - 3y - 2z = 6$$

$$5y - 4z = 9$$

$$3z = 12$$

2. Solve the following systems of equations using elimination.

•

$$2x + 2y = 8$$

$$6x + 2y = 4$$

•

$$4x + y + z = 7$$

$$x + 7y - z = 23$$

$$10x + 4y + 3z = 20$$

•

$$x - 3y - 2z = 6$$

$$2x - 4y - 3z = 8$$

$$-3x + 6y + 8z = -5$$

3. If possible, solve the following systems. If not, state whether each is over- or under-determined. If the system is over-determined, find a contradiction. If the system is underdetermined, solve it up to its free variables.

•

$$3x + 2y + z = 10$$

$$2x + y + 3z = 12$$

$$7x + 4y + 7z = 34$$

•

$$3x + y + 4z = 8$$

$$9x - 3y - 2z = 4$$

$$x + y + z = 3$$

•

$$3x + y + 4z = 8$$

$$9x - 3y - 2z = 4$$

$$x + y + z = 4$$

4. For what values of the parameter k does the following system have a) no solution, b) one solution, and c) more than one solution?¹

$$x_1 + x_2 = 1$$

$$x_1 - kx_2 = 1$$

¹**Source:** Moore and Siegel 13.4 #3