

SYSTEMS OF LINEAR EQUATIONS

For the following linear systems:

- Express the system as a single matrix equation $A\vec{x} = \vec{b}$ (write out the matrix A and vector \vec{b}).
- Graph the equations and state whether the system has zero, one, or infinite solutions.
- Find a matrix B such that $BA\vec{x} = \vec{x}$ and $AB\vec{b} = \vec{b}$, or state why this is impossible.

(a)	(b)	(c)	(d)	(e)
$2x_1 + 4x_2 = 2$ $3x_1 + 5x_2 = 0$	$-x_1 + 4x_2 = -2$ $3x_1 + 3x_2 = 1$	$-2x_1 - 3x_2 = 3$ $x_1 + 6x_2 = 4$ $x_1 = 7$	$-3x_1 + 2x_2 = -2$ $x_1 + x_2 = 1$ $-2x_1 + 3x_2 = -1$	$-2x_1 + 3x_2 = -3$ $4x_1 - 6x_2 = 2$

MATLAB

- (a) – (d) Follow the instructions given in the MATLAB file HW_02.m

THE MONTY HALL PROBLEM

The Monty Hall Problem (https://en.wikipedia.org/wiki/Monty_Hall_problem) is a fictional game show where you are shown three doors. Behind two of the doors are common goats, but behind the third is a fabulous prize (classically, the prize is “a brand new car!” but in our enlightened age, let’s say it’s a fabulous environmentally-friendly bicycle). You are asked to choose a door. Then, the host (who knows where the bike is) opens one of the remaining two doors which has a goat behind it. You can then either stick with your original guess or change your guess. The problem asks, what should you do to maximize your chances of getting the bicycle?

Instructions: Create a playable Monty Hall game in MATLAB. Represent the three doors with a row vector with three elements. A “0” means the door is closed. A “-1” means the door has been opened and behind it is a goat. A “99” means the door has been opened and behind it is a brand new bicycle! Your game must:

- Choose a random number between 1 and 3 which indicates which door contains the bicycle.
- Show the player the “doors” vector [0, 0, 0] indicating all the doors are closed and ask the player which door they would like to choose (1, 2, or 3).
- Choose one of the remaining doors with a goat to reveal to the player. If the player chose the bike door, then randomly choose the next door to open. If the player chose a goat, then open the other door with the goat. Show them the doors vector.
- Ask the player which door they would choose now (1, 2, or 3).
- Reveal whether the player won a goat or a fabulous bicycle.