

Project #1

This project is worth 40 points.

Honor System:

- You can use notes, videos, book, computer and help from any tutors at Cabrillo. You **CANNOT** talk about or share your work with any other students in our class.
- Do not write on this. Do work separately.
- Each problem should have plenty of space. Font size should be at least 11 AFTER printing. If font is too small, I will not read it.
- Clearly label the problem number and parts of the problem. Do not make me hunt for your work or the different parts of the problem.
- Presentation matters and work must be shown, even in Excel files. If necessary work is missing, points will be deducted. Bring your work to office hours as it progresses (not just the day before you turn it in!) to make sure you have all the necessary details.
- A single PDF of the project must be submitted in Canvas on or before the due date. You must convert the files to PDF digitally (see Projects #1 video) or scan in the physical pages as a PDF. Only 1 file per person is to be submitted! Any missing parts of files received separately then your original submission will receive 0 points.
- For late projects, a 15% per day overall score deduction will be applied for each day after the due date. After 7 days, a 0 will be inputted for the project score.

Scoring

#1 = 4 points,
#2 = 12 points,
#3 = 4 points,
#4 = 10 points,
#5 = 10 points,

1. Use the following matrices to compute each expression and show the resulting matrix. If the matrix does not exist, write "DNE."

For each part, be sure to present the Excel formula (code) used to answer each part full for credit. e.g. For $-3A + B$ the formula presented would be " $=-3*A+B$ "

$$A = \begin{bmatrix} 1 & 9 \\ 2 & 5 \\ -1 & 5 \end{bmatrix} \quad B = \begin{bmatrix} 4 & -3 & 0 \\ 6 & 1 & -2 \end{bmatrix} \quad C = \begin{bmatrix} 3 & -4 \\ 1 & 8 \\ 5 & -8 \end{bmatrix}$$

(a) $B(2C - A)$

(b) $AB + CB$

2. John is in charge of ordering coffee for three coffee houses. Based on historical sales, each week he orders 100 pounds of Coffee A, 150 pounds of Coffee B, 200 pounds of Coffee C and 75 pounds of Coffee D for the downtown location. He orders 50 pounds of Coffee A, 100 pounds of Coffee B, 150 pounds of Coffee C and 150 pounds of Coffee D for the beach-front location. Finally he orders 200 pounds of Coffee A, 250 pounds of Coffee B, 300 pounds of Coffee C and 100 pounds of Coffee D for the South County locatoin.

(a) Express this information using a 4×3 matrix A . Be sure to label the rows and columns.

(b) For a week in which the downtown store is closed due to a holiday, he reduces his order for the downtown location by 20%, reduces his order for the beach-front location by 10%, and **increases** his order for the South County location by 25%. Express this information using a 4×3 matrix B .

(c) Find $A + B$ and explain what the entries represent.

3. For the following problems:

(a) Write the system of equations corresponding to the given matrix.

(b) Find the solution to the system and write it as an ordered pair or ordered triple. If no solution exists, write "no solution". If there are infinitely many solutions, write the solution as a system of equations and identify the parameter (free variable).

$$\begin{bmatrix} 1 & -1 & 1 & 1 \\ 0 & 1 & \frac{-3}{5} & \frac{6}{5} \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

4. Suppose that an economy is composed of three industries - Agriculture, Manufacturing and Services. Each of these industries depends on the others for some of its raw materials. Suppose that to make \$1 of Agriculture it takes \$0.15 of Agriculture, \$0.35 of Manufacturing and \$0.20 of services. To make \$1 of Manufacturing it takes \$0.10 of Agriculture, \$0.22 of Manufacturing and \$0.45 of Services. To make \$1 of Services it takes \$0.11 Agriculture, \$0.43 of Manufacturing and \$0.08 of Services. Give the input-output matrix A for this economy.

(a) Give the input-output matrix A for this economy.

(b) Find matrix $(I - A)^{-1}$. Round all entries to 2 decimal places.

(c) At what level output should each sector produce to meet a demand of \$7 billion dollars worth of Agriculture, \$4 billion dollars worth of Manufacturing and \$8 billion dollars worth of Services? Show work, including matrices used to solve this. If work is done using Excel, have all matrices clearly labeled and write your solution as a complete sentence.

5. Kelly has \$20,000 to invest. As her financial planner, you recommend three Franklin Mutual Funds with the corresponding rate of returns: Total Return at 5%, High Income at 7% and Global Bond at 10%. Kelly wishes to earn an average return of \$1390.

(a) Write a system of equations for this problem and state what your variables represent.

(b) Solve the system by writing an augmented matrix and reducing it completely. Show your augmented matrix and the reduced matrix. If using the URL to reduce, say so, if done by hand, show your work.

(c) Prepare a table showing the following 3 investment options. **Note: No negative numbers allowed!**

- 1.) An option that uses all three funds.
- 2.) An option that uses only two funds.
- 3.) An option where the Global Bond fund investment is at least \$1,000.

EXTRA CREDIT (5 points):

Use $\begin{bmatrix} 1 & 0 & 0 \\ 3 & 1 & 5 \\ -2 & 0 & 1 \end{bmatrix}$ to encode a message that includes your first and last name and major.

For example, I would have to encode the message STEPHANIE TRAN MATH
Make sure to present all your work done in Excel.