Wilfrid W. Csaplar Jr., Ph.D. Economics 305 Exam #3 2020/4/1

Do NOT write your name anywhere. (Canvas will tell me who turned in the exam.) Take pictures of your answers and use your own software or https://pdfcandy.com/ to create a PDF. Upload that to Canvas. Upload each answer as a separate file with that question. Failure to follow directions will cost you one point.

You are not allowed to use your books, notes, the internet, or other people when taking this test. You can use the internet to access Canvas and to convert your answers to PDF files. Nothing else.

Failure to follow these directions will cost you 1 point. The test has 100 points (to be scaled up to 170 points) and is scheduled to take 50 minutes. Therefore, expect to spend 1 minute for every 2 points. For example, a 12-point question should take 6 minutes. I have it set up to only give you an hour and a half.

Show all work on all questions.

1) (10 points each) Answer THREE of the following assuming that

$$A=\begin{bmatrix}1&3&2\\6&0&4\\-1&5&10\end{bmatrix}, B=\begin{bmatrix}-1&2&-3\\4&0&-1\\5&1&6\end{bmatrix}, C=\begin{bmatrix}10\\0\\20\end{bmatrix}, p=\begin{bmatrix}3\\2\\4\end{bmatrix} q=\begin{bmatrix}10\\100\\200\end{bmatrix}, w=\begin{bmatrix}11\\12\end{bmatrix} z=\begin{bmatrix}20\\40\end{bmatrix}$$

A) A^T-3B
B) $\pi = p^Tq - w^Tz$
C) C^TB
D) B - 2A
E) 10P - 2Q

2) (12 points) Solve the system of equations r = 10 - Y/100 and r = 2 + Y/700 by EITHER graphing OR substitution and elimination.

3) (12 points) Answer EITHER Part A OR Part B.
A) Prove the trace(AB) = trace(BA) if A = [4 2 5] and B^T = [1 3 -1].
B) Prove $\begin{bmatrix}3&-1\\6&-2\end{bmatrix}$ is idempotent.

4) (14 points) Answer EITHER Part OR Part B.
A) Suppose 70% of people in Bethany stay in Bethany and the rest move to Pittsburgh. 90% of Pittsburghers stay there and the rest move here. Setup the migration matrix. If 100 start in Bethany and 1000 start in Pittsburgh, then how many will be in each location in a year. Use matrix multiplication to find the answer.
B) Suppose $1 of food uses 20¢ of food (to feed the workers) and 10¢ of energy to make. $1 of energy uses 5¢ of food and 15¢ of energy to make. Write the Leontief input-output matrix. If we want 200 units of food and 100 units of energy, use matrix multiplication to find out how much of each gets used up in the process.

5) (14 points) Set up EITHER the equations in Part A OR the equations in Part B as an partitioned matrix. Use row operations to get it into reduced row-echelon form to solve for X & Y.
A) 3X - Y = 11 -X + Y = -1
B) 2X - Y = 7 X + Y = 8

6) (18 points) For EITHER Part A OR Part B, set up the equations as a partitioned matrix. Use row operations to solve for X, Y, Z.
A) Y + 3Z = 7 X + Y + Z = 2 2X + 3Y + 5Z = 11
B) Y - Z = 3 X + Y + 2Z = 2 3X + 4Y + 5 Z = 6

The following are actual songs by the band Deliverance. One is about food. One is definitely not about

food. I have no idea what the third one is about. Which one is which?

Creamed Chip Beef

Cheeseburger Maker Du

Purgatory Sandwich With Mustard.

(Why are you doing a zero point question on April Fools' day?)