Name _____ ECON 186 Fall 2017

Midterm

You have 90 minutes to finish the closed-book exam. You must show all of your work to get full credit. There are 6 problems with a total of 99 points (1 point for writing your name). Good luck!

Problem 1

Consider the national income determination model

$$\begin{aligned} Y &= C + I_0 + G \\ C &= a + b(Y - T_0) \qquad (a > 0, 0 < b < 1) \\ G &= gY \qquad\qquad (0 < g < 1) \end{aligned}$$

a) Identify the endogenous variables (3 points).

b) Write a system of equations in the form $Ax = d$ (4 points).

c) Calculate the equilibrium values of Y, C and G, using Cramer's Rule (14 points).

Problem 2

Consider the following matrix

$$A = \begin{bmatrix} 3 & -1 & 2 \\ 1 & 2 & -2 \\ 5 & -3 & 1 \end{bmatrix}$$

a) Reduce the matrix A to Row Echelon Form (12 points).

b) What is the rank of A (3 points)?

b) Is this matrix singular? Why(3 points)?

Problem 3

Consider the following matrix

$$A = \begin{bmatrix} 1 & 5 & 2 \\ 1 & 1 & 7 \\ 0 & -2 & 4 \end{bmatrix}$$

a) Calculate the determinant of A (5 points).

b) Find the inverse of A (10 points).

Problem 4

Find the derivatives for the following functions

a) $y(x) = (6\sqrt{x} + 2x)\ln(x^4 - \frac{1}{x})$ (7 points).

b) $U(c) = [\alpha c^\rho + \beta(1-c)^\rho]^{\frac{1}{\rho}}$ (10 points).

Problem 5

Find the partial derivative $\frac{\partial z}{\partial x}$ and total derivative $\frac{dz}{dx}$ of the function $z(x, y) = \frac{3e^{-2x}+2y}{x}$, where $y = -x^2 + 2x + 14$ (15 points).

Problem 6

Consider the system of equations

$$\begin{aligned} u &= y - z \\ v &= x + z^2 \\ w &= x - y^2 + 2yz \end{aligned}$$

Find the Jacobian (determinant of the Jacobian matrix) of the system (13 points).