Wilfrid W. Csaplar Jr., Ph.D. Economics 205 Exam #1 2020/1/31

Write your name on the cover of the test booklet and nowhere else. Enclose this sheet with the booklet. 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 cannot give extra time because some students have a class after your class.

Show all work on all questions.

1) (6 points) For EITHER marginal propensity to consume (MPC) OR marginal product of capital (MPK), determine the dimension (a.k.a. units) of that variable. Briefly state how you reached your conclusion.

2) (6 points) Answer EITHER Part A OR Part B.
A) Which of these statements are true $\mathbf{Z} \subset \mathbf{Q}$ or $\mathbf{Z} \supset \mathbf{Q}$? State your logic.
B) What is meant by $\varnothing$? Give an example.

3) (14 points) Answer EITHER Part A OR Part B.
A) Write the equation for the present value of \$300 paid in 2½ years, when the discount rate is 4% and interest is compounded monthly. State how you found each entry.
B) For both GDP and your bank account balance, would discrete or continuous compounding be applicable? Explain your logic.

4) (16 points) Answer EITHER Part A OR Part B.
A) Plot $X \leq 8$ and (-2, 4) on separate number lines. For each one, determine if it is closed, open, or half closed. State your logic.
B) Find the distance between (-2, 5, 4) and (1, -1, 2).

5) (18 points) Answer EITHER Part A OR Part B.
A) Plot the first five elements of the sequence $a_n = 16*(-½)^n$. Show all work. Is that convergent, divergent, or definitely divergent? Explain your logic.
B) Plot the first five elements of the sequence $a_n = n^2 - n$. Show all work. Is that convergent, divergent, or definitely divergent? Explain your logic.

6) (20 points) Answer EITHER Part A OR Part B.
A) Plot $Y = 24/X$. Find at least 5 points, showing how you got them. Is this function strictly convex, convex, concave, strictly concave, or none of the above? Explain your logic.
B) Suppose somebody had the illogical utility function of $U(X, Y) = Y + X^{1/2}$. Plot the indifference curve four $U(X, Y) = 9$. Plot at least 4 points, showing the mathematics of how you got them. Is this utility function strictly quasi-concave, quasi-concave, quasi-convex, strictly quasi-convex or something else? Explain your logic.

7) (20 points) Answer EITHER Part A OR Part B.
A) Draw a Venn Diagram with the universal set being Bethany College students. Draw two sets, E for economics majors and A for athletes. Put a hash mark to show the area $\bar{A} \cap E$. State how you got that area. State what that area means. Given your graph, what percentage of Bethany students are in there? How did you reach that conclusion?
B) Suppose $A = \{a: a \in \mathbf{Z}_+ \text{ s.t. } a \leq 5\}$, $B = \{1, 3, 7, 10\}$, $C = \{2, 3, 5, 9\}$ and the parent set is $\mathbf{Z}_+$. Find $\bar{A} \cap B$ and $A \cup B \cup C$, and $A \cap B \cap C$. Briefly state how you found them.