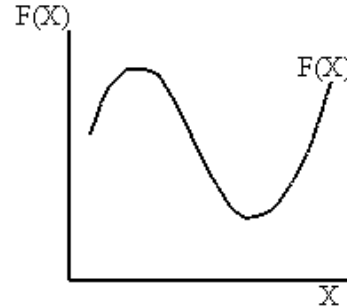


Write your name on the cover of the test booklet and nowhere else. Enclose this sheet with the booklet. Failure to follow these directions will cost you 1 point. The test has 100 points (to be scaled up to 170 points) and is scheduled to take 50 minutes. Therefore, expect to spend 1 minute for every 2 points. For example, a 12-point question should take 6 minutes. I can't give extra time but I will not give much.

1) (6 points) Answer EITHER Part A OR Part B.

A) For the figure to the right, is the relationship one-to-one, onto, and/or a invertable? Explain your logic.

B) Plot the following interval on a number line $[-3, \infty)$. Briefly explain how you did it.



2) (6 points each) For TWO of the following variables state the dimension (units) of the variable and give one sentence of explanation.

- A) Growth rate of GDP
- B) GDP
- C) Marginal Revenue.

3) (8 points) Find the following limit showing all work. $\lim_{n \rightarrow \infty} \left(\frac{20 + \frac{4}{n+1}}{10 + \frac{8}{n^2}} \right)$

4) (10 points) Answer EITHER Part A OR Part B.

A) Plot the point $(-3, 4, 2)$ Briefly explain how you did it.

B) Find the distance between the points $(-1, 4, -6, 8)$ and $(2, -1, -5, 9)$. Show all work.

5) This question refers to the series formed by $s_n = \sum_{t=1}^n \frac{FV}{(1+r)^t}$. Do BOTH Part A and Part B.

A) (8 points) What is the $\lim_{n \rightarrow \infty} \left| \frac{a_{n+1}}{a_n} \right|$

B) (6 points) Is the series convergent or divergent? Explain your logic. **If convergent**, what does it converge to? Show all work. **If divergent**, what does that say about stock values?

6) (16 points) Draw the function $F(X) = X^2 - 2$ over the range $[-3, 3]$ Draw several secants starting at the point $X = 2$. Use that diagram to prove $\lim_{\Delta x \rightarrow 0} (\text{slope of secant}) = \text{slope of tangent}$. Explain what you did.

7) (16 points) Answer EITHER Part A OR Part B.

A) Draw one indifference curve for $U(\text{Gas}, \text{Coats}) = G * C$. Explain how you found the line. Is the function quasi-concave, quasi-convex, or neither? Explain your logic.

B) There is a difference between convex set and a convex function. Draw both a convex set and a convex function. State how you know they are convex.

8) (18 points) Draw a Venn diagram Bethany College students as the universal set. Have a subsets the following: students majoring in Business (B), students who are over 6' tall (T), and students involved in sports (S). Given your diagram, what percentage of Bethany students are in each of the following sets: $B \cup T$, $S \cap T$, and \bar{S} ? Briefly explain your logic.