

Math 1A: Discussion 9/19/2018 Problems

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Problem Set 1

Question 1

Compute the following limit and justify your steps.

$$\lim_{x \rightarrow -1} x^2 \arctan(x^2 - 2)$$

Problem Set 2

Question 2

Use the ϵ - δ definition of the limit to show that

$$\lim_{x \rightarrow -1} \frac{2x^2 + 3x + 1}{x + 1} = -1$$

(Hint: Can you factor?)

Question 3

Show that there is a point c with $|c| < 1$ such that $f(c) = 0$, where

$$f(x) = \sin\left(\frac{\pi}{2}x\right) + x^2 - 1$$

Question 4

- Use the ϵ - δ definition of the limit to show that

$$\lim_{x \rightarrow 0} |x| = 0$$

- Now consider the function defined by

$$f(x) = x \text{ if } x > 0$$

$$f(x) = -x \text{ if } x < 0$$

$$f(x) = 1 \text{ if } x = 0$$

Use the previous part to show that f is not continuous at $x = 0$. (This should be short!)

Question 5

Use the ϵ - δ definition of the limit to show that

$$\lim_{x \rightarrow 0} x^4 + 2 = 2$$

Problem Set 3

Question 6 (*)

- Use the Squeeze Theorem to show that

$$\lim_{x \rightarrow 0} \left[x \sin \left(\frac{1}{x^2} \right) \right] = 0$$

- Now use the ϵ - δ definition of a limit to show that

$$\lim_{x \rightarrow 0} \left[x \sin \left(\frac{1}{x^2} \right) \right] = 0$$

(Hint: $-1 \leq \sin \left(\frac{1}{x^2} \right) \leq 1$ when $x \neq 0$. Why?)