

# Math 1A: Discussion 9/21/2018 Problems

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September 21, 2018

## Question 1: Intermediate Value Theorem

Show that the function

$$f(x) = \sin^2\left(\frac{\pi}{2}x\right) + 2x^3$$

has a zero.

## Question 2: Infinite Limits

Solve for the following infinite limits.

$$\lim_{x \rightarrow \infty} \arctan(\ln(x))$$

$$\lim_{x \rightarrow \infty} \frac{x^2 + 1}{3x^2 + \sqrt{x} + 2}$$

$$\lim_{x \rightarrow \infty} \frac{\sqrt{x^3 + 2}}{2x^2 + 1}$$

$$\lim_{x \rightarrow \infty} 2\log(x + 1) - \log(x^2 + 1)$$

## Question 3: Differentiability

Show that the function

$$f(x) = 2x + 1 \text{ if } x \geq 0$$

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

is not differentiable at  $x = 0$ .