# Math 1A: Discussion 9/12/2018 Problems

## Jeffrey Kuan

## September 12, 2018

After this week, you should be able to:

- Find the average velocity over a time interval.

- Determine the limit of a function from its graph.

- Find a limit by plugging in.

- Find a limit that gives $0/0$ when plugging in by applying one of the following strategies:

    - Factoring the numerator and denominator and canceling.
    - Simplifying.
    - Rationalizing the numerator.

- Use asymptotic analysis to find infinite limits.

You will also be expected to be comfortable with the following precalculus concepts:

- Factoring quadratic polynomials. Recognizing difference of squares.

- Knowing the graph of the exponential function $e^x$, the logarithm $\log(x)$, and sine/cosine/tangent.

- Computing unit circle values of sine, cosine, and tangent quickly (use a reference angle, and then use All Students Take Calculus).

- Add and subtract fractions with variables by putting everything over a common denominator.

# Problem Set 1

## Question 1: Precalculus Review

Do these questions *as fast and accurately as possible.*

- Expand $(3 - 2x)(3 + 2x)$.

- Factor $x^2 - 9$ and $x^2 - 5x + 6$.

- Compute $\sin\left(\frac{4\pi}{3}\right)$, $\cos\left(\frac{4\pi}{3}\right)$, and $\tan\left(\frac{4\pi}{3}\right)$.

- Simplify
$$\frac{2}{1-x} + \frac{1}{2-x}$$

- Compute
$$\log_4\left(\frac{1}{8}\right)$$

# Problem Set 2

## Question 2: Limits, Limits Everywhere

Compute the following limits. Some of them might be infinite.

$$\lim_{x \to 0} \frac{\cos(2x)}{1 + 2\sin(x)}$$

$$\lim_{h \to 0} \frac{\sqrt{1 + h^2} - 1}{h}$$

$$\lim_{x \to 2} \frac{\frac{1}{(x-1)^2} - 1}{x - 2}$$

$$\lim_{x \to \pi^+} \frac{x^2}{\sin(x)}$$

$$\lim_{x \to 3} \frac{x^2 - 6x + 9}{x^2 - 9}$$

$$\lim_{x \to 0} e^{-x} \sin\left(x + \frac{5\pi}{6}\right)$$

$$\lim_{x \to 0^+} e^x \ln(x)$$

$$\lim_{x \to \frac{\pi}{4}^-} \frac{x^2}{1 - \tan(x)}$$

$$\lim_{x \to 0} \frac{e^{(e^x - 1)}}{1 + e^x}$$

$$\lim_{h \to 0} \frac{\sqrt{2 + h} - \sqrt{2 - h}}{h}$$

$$\lim_{h \to 0} \frac{\frac{1}{1+h} + \frac{1}{1-h} - 2}{h^2}$$

# Problem Set 3

No more questions!

2