

Math 201 Quiz 4A

September 16, 2019

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Name: ANSWERS

Instructions: No calculators. Use your own scrap. Write your fully simplified answers in the space provided.

1. Compute the following limits, or write "DNE" if they do not exist:

(a)  $\lim_{x \rightarrow 0} \frac{\sin^2 x - 1}{4 - 3x^4} = \underline{-1/4}$  (b)  $\lim_{x \rightarrow 25} \frac{5 - \sqrt{x}}{25x - x^2} = \underline{1/250}$

(c)  $\lim_{h \rightarrow 0} \frac{\frac{1}{(x+h)^2} - \frac{1}{x^2}}{h} = \underline{-2/x^3}$  (d)  $\lim_{x \rightarrow 3} \frac{2x-6}{|x-3|} = \underline{DNE}$

(e)  $\lim_{x \rightarrow 0^+} \left( \frac{1}{x} - \frac{1}{|x|} \right) = \underline{0}$  (f)  $\lim_{x \rightarrow 0} \frac{\sin x^3}{x} = \underline{0}$

(g)  $\lim_{t \rightarrow 0} \frac{\tan 3t}{3t + \sin 2t} = \underline{3/5}$  (h)  $\lim_{x \rightarrow 0^+} \frac{3 \cos x - 3}{\sin x} = \underline{0}$

(i)  $\lim_{x \rightarrow 0} \frac{\sin 4x}{3x^2 - 2x} = \underline{-2}$  (j)  $\lim_{x \rightarrow 0} \frac{\sin 3x \sin 5x}{2x^2} = \underline{15/2}$

2. Suppose  $2x - 1 \leq h(x) \leq x^4 - x^2 + 1$  for all  $x$ , what is  $\lim_{x \rightarrow 1} h(x) = \underline{1}$

3. Let  $f(x) = 3x^2 - 1$ , compute  $\lim_{h \rightarrow 0} \frac{f(2+h) - f(2)}{h} = \underline{12}$

Bonus:

*the slope of  $f(x)$  at  $x=2$  is 12  
OR the derivative of  $f(x)$  at  $x=2$  is 12.*

1. Explain what the answer to problem 3 means OR the derivative of  $f(x)$  at  $x=2$  is 12.

2. Let  $f(x)$  be a function. Write down an equation that defines when  $f(x)$  is continuous at a point  $x = a$ .

$\lim_{x \rightarrow a} f(x) = f(a)$

3. Find  $a$  and  $b$  so that  $f(x) = \begin{cases} \frac{4 \sin x}{x}, & x < 0 \\ a, & x = 0 \\ b \cos x + 1, & x > 0 \end{cases}$  is continuous for all  $x$ .  $a = \underline{4}$ ,  $b = \underline{3}$