

WRITE YOUR NAME:

MAC 2241 Homework 4

Due in class, Friday February 24th

You can use more paper if necessary, but please STAPLE

Question 1. Evaluate the limit, if it exists.

$$\lim_{x \rightarrow -4} \frac{\sqrt{x^2+9}-5}{x+4}$$

$$\lim_{x \rightarrow -4} \frac{\sqrt{x^2+9}-5}{x+4} \cdot \frac{\sqrt{x^2+9}+5}{\sqrt{x^2+9}+5}$$

$$= \lim_{x \rightarrow -4} \frac{(\sqrt{x^2+9})^2 - 5^2}{(x+4)(\sqrt{x^2+9}+5)} = \lim_{x \rightarrow -4} \frac{x^2+9-25}{(x+4)(\sqrt{x^2+9}+5)}$$

$$= \lim_{x \rightarrow -4} \frac{x^2-16}{(x+4)(\sqrt{x^2+9}+5)} = \lim_{x \rightarrow -4} \frac{(x+4)(x-4)}{(x+4)(\sqrt{x^2+9}+5)}$$

$$= \lim_{x \rightarrow -4} \frac{x-4}{\sqrt{x^2+9}+5} = \frac{-4-4}{\sqrt{(-4)^2+9}+5}$$

$$= \frac{-8}{\sqrt{16+9}+5} = \frac{-8}{\sqrt{25}+5} = \frac{-8}{5+5} = \frac{-8}{10} = -\frac{4}{5}$$

Question 2. Evaluate the limit, if it exists.

$$\lim_{x \rightarrow 0} \left( \frac{\sin x}{x} \cdot \frac{\sin x}{x} \right)$$

$$= 1 \cdot 1 = 1$$

using the known limit  $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$ .

Question 3. Evaluate the limit, if it exists.

$$\lim_{x \rightarrow 0} \left( \frac{\sin x}{x} \cdot \lim_{x \rightarrow 0} \frac{\sin^2 x}{x} \right)$$

$$= 1 \cdot 0 = 0$$

using the known limit  $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$

Question 4. Evaluate the limit, if it exists.

$$\lim_{x \rightarrow 0} \frac{\sin x}{x^2}$$

$$\lim_{x \rightarrow 0} \left( \frac{\sin x}{x} \cdot \frac{1}{x} \right)$$

⏟  
this part  
approaches 1

⏟  
this part  
does not approach  
a limit

limit does not exist (we get extreme numbers)