Math 131 - Quiz 1

Name key

August 23, 2023

Score _____

Show all work to receive full credit. Supply explanations when necessary. This quiz is due August 28.

1. (5 points) For each part of this problem, use a table of numerical values to estimate the limit. Your tables must show function values at six or more points.

   (a) $\lim_{x\to 1}\left(\frac{1}{\ln x}-\frac{1}{x-1}\right)$

$f(x) = \frac{1}{\ln x} - \frac{1}{x-1}$

x	$f(x)$
0.9	0.508778
0.99	0.500837
0.999	0.500083
1.1	0.492059
1.01	0.499171
1.001	0.499917

Looks like $\lim_{x\to 1}\left(\frac{1}{\ln x}-\frac{1}{x-1}\right) = \boxed{0.5}$

   (b) $\lim_{t\to 0}\frac{t-\tan t}{t^3}$

$f(t) = \frac{t-\tan t}{t^3}$

t	$f(t)$
-0.1	-0.334672
-0.01	-0.333347
-0.001	-0.333333
0.1	-0.334672
0.01	-0.333347
0.001	-0.333333

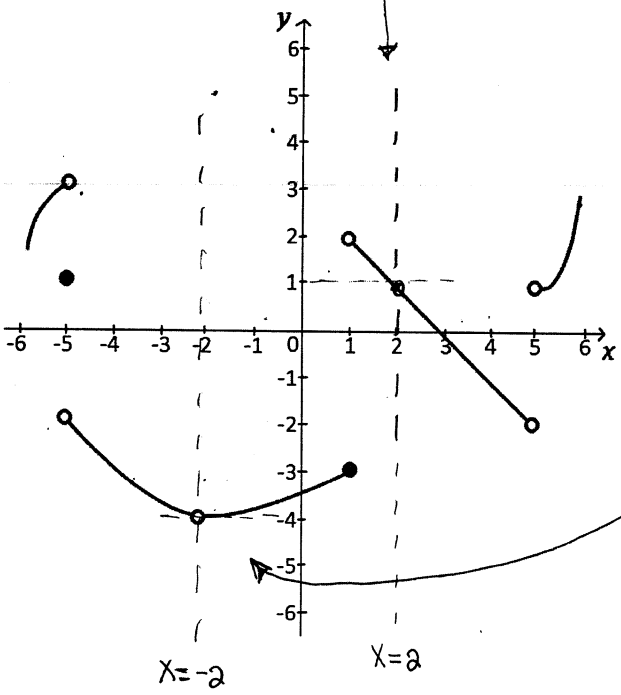
Looks like $\lim_{t\to 0}\frac{t-\tan t}{t^3} = \boxed{-\frac{1}{3}}$

Turn over.

2. (1 point) The graph of $y = f(x)$ is shown below. Use the graph to estimate each limit.

(a) $\lim_{x \to 2} f(x) \approx$ 1

(b) $\lim_{x \to -2} f(x) \approx$ -4



3. (4 points) Refer to the four ways in which a limit may fail to exist. Say why each of the following limits does not exist. Show work or supply a brief explanation.

(a) $\lim_{x \to 0} x^2 \ln x$ FAILURE #4 -- $x^2 \ln x$ IS NOT DEFINED TO THE LEFT OF $X = 0$.

(b) $\lim_{x \to 3} \frac{x^2 - 3}{|x - 3|}$ FAILURE #2 -- A TABLE OF NUMERICAL VALUES SHOWS THAT FUNCTION VALUES GROW WITHOUT BOUND AS $X \to 3$

(c) $\lim_{x \to 0} \frac{\sqrt{x^2}}{x}$ FAILURE #1 -- LIMIT FROM LEFT IS -1
LIMIT FROM RIGHT IS 1

(d) $\lim_{x \to 0} \sqrt{x^3}$

FAILURE #4 -- $\sqrt{X^3}$ IS NOT DEFINED TO THE LEFT OF $X = 0$