

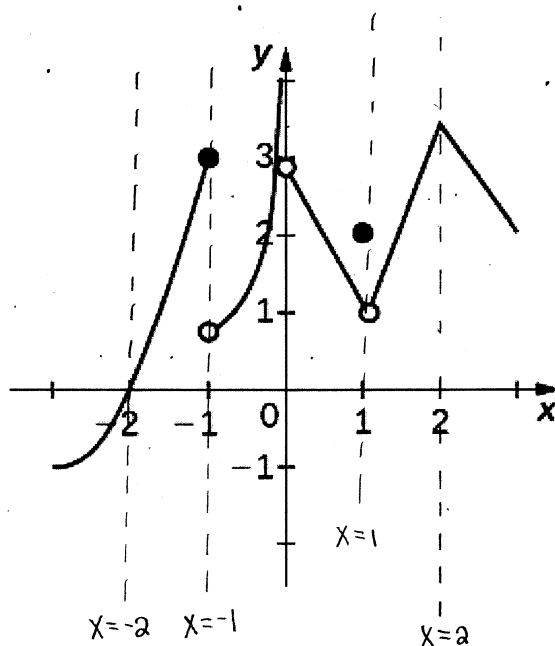
Math 131 - Assignment 1

August 21, 2024

Name key
Score _____

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

1. Referring to the graph of $y = f(x)$ shown below, estimate each of the following or explain why it does not exist.



(a) $f(1) = 2$

(b) $\lim_{x \rightarrow 1} f(x) = 1$

(c) $\lim_{x \rightarrow 2} f(x) \approx 3.5$

(d) $\lim_{x \rightarrow -2} f(x) = 0$

(e) $\lim_{x \rightarrow -1} f(x)$ DNE $\left. \begin{array}{l} \text{LIMIT FROM LEFT} = 3 \\ \text{LIMIT FROM RIGHT} \approx 0.8 \end{array} \right\} \text{ NOT EQUAL} \Rightarrow \text{NO LIMIT}$

(f) $f(0)$ DNE

THERE IS NOT POINT ON
THE GRAPH FOR $x=0$.

Turn over.

- ② Use a table of numerical values to estimate the limit. Your table must show function values at six or more points.

$$f(x) = \frac{x^2 - 5x}{\sqrt{x} - \sqrt{5}}$$

$$\lim_{x \rightarrow 5} \frac{x^2 - 5x}{\sqrt{x} - \sqrt{5}} \approx 22.36$$

x	4.9	4.99	4.999	5.1	5.01	5.001	5.0001
f(x)	21.803	22.305	22.355	22.921	22.417	22.366	22.361

3. For any nonzero real number x , let $f(x)$ be the leftmost nonzero digit of x when x is written in standard decimal form. Explain why $\lim_{x \rightarrow 0} f(x)$ does not exist, and give some supporting data (perhaps a table of values).

x	0.1	0.005	0.00008	-0.02	-0.0007
f(x)	1	5	8	2	7

THE VALUES OF f
JUST BOUNCE AROUND
AS $x \rightarrow 0$.
FAILURE #3

- ④ Use a table of numerical values to estimate the limit. Your table must show function values at six or more points.

$$f(x) = \frac{x^2 + x - 6}{|x - 2|}$$

$$\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{|x - 2|}$$

x	1.9	1.99	1.999	2.1	2.01	2.001
f(x)	-4.9	-4.99	-4.999	5.1	5.01	5.001

IT LOOKS LIKE
LIMIT FROM LEFT = -5
AND LIMIT FROM RIGHT = 5.

LIMIT DNE

- ⑤ Referring to problem 4 (directly above), carefully explain why $x = 2$ should NOT be in your table of values.

FOR A LIMIT AT $x = 2$, WE SIMPLY DO NOT CARE ABOUT OR
NEED THE FUNCTION VALUE AT $x = 2$. WE ONLY CARE ABOUT
VALUES ON THE SIDES OF $x = 2$.

- ⑥ Carefully explain why the limit does not exist: $\lim_{x \rightarrow -4} \sqrt{4+x}$.

IT'S FAILURE #4. $\sqrt{4+x}$ IS NOT DEFINED WHEN $x < -4$.
THE LIMIT CANNOT POSSIBLY EXIST.

7. Find the limit analytically by using limit laws. Show all steps.

$$\lim_{x \rightarrow 4} \frac{x^2 - 6x + 3}{\sqrt{x}} = \lim_{x \rightarrow 4} \frac{(x^2 - 6x + 3)}{\sqrt{x}}$$

$$= \frac{\left(\lim_{x \rightarrow 4} x\right)^2 - 6\left(\lim_{x \rightarrow 4} x\right) + 3}{\sqrt{\lim_{x \rightarrow 4} x}} = \frac{(4)^2 - 6(4) + 3}{\sqrt{4}} = \frac{16 - 24 + 3}{2} = \boxed{-\frac{5}{2}}$$