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Link: <http://www.rootmath.org/calculus/estimating-limits-numerically>

I. Instructions: Estimate the given limit using a numerical approximation

1. Use the table to approximate $\lim_{x \rightarrow 3} \frac{x+3}{2x^2-18} =$

x	-3.1	-3.01	-3.001	-3	-2.999	-2.99	-2.9
f(x)	-0.08	.083	.0833	0	-0.0833	-0.0839	-0.0847

1.22
1.102

2. Use the table to approximate $\lim_{h \rightarrow 0} \frac{(5+h)^2 - 25}{h} =$

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
f(x)	9.9	9.98	9.999	und.	10.001	10.01	10.1

3. $\lim_{x \rightarrow 0} \frac{\sin(x)}{x} =$

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
f(x)	-0.983	-0.9998	-0.9999	0	0.999	0.9998	0.9983

4. $\lim_{x \rightarrow 0} \frac{\sqrt{x+1}-1}{x} =$

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
f(x)	.5131	.5012	.5001	—	.4998	.4987	.4880

5. Find $\lim_{x \rightarrow 0} f(x)$ if $f(x) = \begin{cases} x-1 & x < 0 \\ x^2 & x \geq 0 \end{cases}$

x	-0.1	-0.01	-0.001	0	0.001	0.01	0.1
f(x)	-1.1	-1.01	-1.001	0	0.000001	0.0001	0.01

6. Find $\lim_{x \rightarrow 2} \frac{x+1}{x-2} =$

x	1.9	1.99	1.999	2	2.001	2.01	2.1
f(x)	-2.9	-2.99	-2.999	—	3.001	3.01	3.1

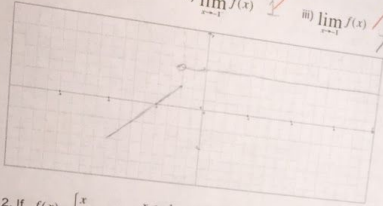
7. Find $\lim_{x \rightarrow 1} \frac{x^2}{(x-1)^2} =$

x	0.9	0.99	0.999	1	1.001	1.01	1.1
f(x)	81	9801	998001	—	1002001	10201	121

III. Graph the following functions and find their limits

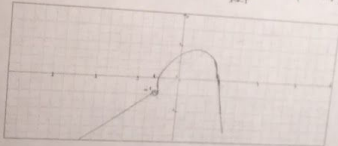
1. $f(x) = \begin{cases} x+2 & x \leq -1 \\ 2 & x > -1 \end{cases}$

Find i) $\lim_{x \rightarrow -1^-} f(x)$ \checkmark ii) $\lim_{x \rightarrow -1} f(x)$ \checkmark iii) $\lim_{x \rightarrow -1^+} f(x)$ \checkmark



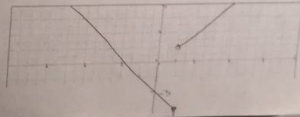
2. If $f(x) = \begin{cases} x & x < -1 \\ -x^2 + 2x & x \geq -1 \end{cases}$ sketch the graph and find

i) $\lim_{x \rightarrow -1^-} f(x)$ \checkmark ii) $\lim_{x \rightarrow -1} f(x)$ \checkmark iii) $\lim_{x \rightarrow -1^+} f(x)$ \checkmark



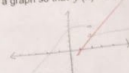
3. If $f(x) = \begin{cases} -x-3 & x \leq 1 \\ x+1 & x > 1 \end{cases}$ sketch the graph and find

i) $\lim_{x \rightarrow 1^-} f(x)$ \checkmark ii) $\lim_{x \rightarrow 1} f(x)$ \checkmark iii) $\lim_{x \rightarrow 1^+} f(x)$ \checkmark

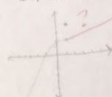


4. Give an example of a two-sided limit of a piecewise function where the limit does not exist.

5. Sketch a graph so that $f(2)=5$ and $\lim_{x \rightarrow 2} f(x)=5$ $\lim_{x \rightarrow 2} f(x)=3$



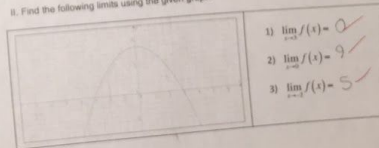
6. Explain the meaning of $\lim_{x \rightarrow 1} f(x)=2$ when x approaches 1. Should we be able to obtain $\lim_{x \rightarrow 1} f(x)=2$ and $f(1)=4$? Justify the answer.



7. Explain the meaning of $\lim_{x \rightarrow 1} f(x)=2$ and $\lim_{x \rightarrow 1} f(x)=3$. Is it possible that $\lim_{x \rightarrow 1} f(x)$ exists? Justify the answer.

NO, because f(x) should have a "y" value? \checkmark

8. Find the following limits using the given graph



- 1) $\lim_{x \rightarrow 1} f(x) = 5$ \checkmark
- 2) $\lim_{x \rightarrow 1} f(x) = 9$ \checkmark
- 3) $\lim_{x \rightarrow 1} f(x) = 5$ \checkmark