

Math 108
Quiz 1, Limits

Name ANSWER KEY A
February 18, 2009

Please show all work neatly. Use of calculators is permitted.

You should try to solve all limits algebraically, but some problems may require a table of values, and you can always confirm your algebra with a table. Answers with no work will receive no credit. A graph alone does not constitute "work."

1. Find each of the following limits, if the limit exists. If the limit does not exist, write DNE.

a) $\lim_{x \rightarrow 1} \frac{x^2 - 4x + 3}{x - 3} = \frac{0}{-2} = \boxed{0}$

plugin: $\frac{1-4+3}{1-3} = \frac{0}{-2}$

b) $\lim_{x \rightarrow 3} \frac{x^2 - 4x + 3}{x - 3} = \lim_{x \rightarrow 3} \frac{(x-3)(x-1)}{(x-3)} = \lim_{x \rightarrow 3} (x-1) = \boxed{2}$

plugin: $\frac{9-12+3}{3-3} = \frac{0}{0}$ keep going

c) $\lim_{x \rightarrow 5} \frac{x-1}{x^2-6x+5} \quad \boxed{\text{DNE}}$

plugin: $\frac{5-1}{25-30+5} = \frac{4}{0}$

d) $\lim_{x \rightarrow 1} \frac{x-1}{x^2-6x+5} = \lim_{x \rightarrow 1} \frac{(x-1)}{(x-5)(x-1)} = \frac{1}{1-5} = \boxed{-1/4}$

plugin: $\frac{1-1}{1-6+5} = \frac{0}{0}$ keep going

e) $\lim_{x \rightarrow 1} \frac{x^5 - 1}{x - 1}$ either: $\lim_{x \rightarrow 1} \frac{(x-1)(x^4 + x^3 + x^2 + x + 1)}{(x-1)} = 1+1+1+1+1 = \boxed{5}$ OR

plugin: $\frac{0}{0}$

x	.9	.99	.999	1	1.001	1.01	1.1
f(x)	4.0951	4.90095	4.99001	-	5.01001	5.10105	6.1051

2. Consider the following function: $f(x) = \begin{cases} x^2 - 2x, & \text{if } x \geq 0 \\ x - 4, & \text{if } x < 0 \end{cases}$

a) Find $\lim_{x \rightarrow 3} f(x)$, if it exists. 3 ($3 \geq 0$, so $\lim_{x \rightarrow 3} f(x) = \lim_{x \rightarrow 3} x^2 - 2x = 9 - 6 = 3$)

b) Find $\lim_{x \rightarrow 0^+} f(x)$, if it exists. 0 $\lim_{x \rightarrow 0^+} f(x) = \lim_{x \rightarrow 0^+} x^2 - 2x = 0 - 0 = 0$

c) Find $\lim_{x \rightarrow 0^-} f(x)$, if it exists. -4 $\lim_{x \rightarrow 0^-} f(x) = \lim_{x \rightarrow 0^-} x - 4 = -4$

d) Find $\lim_{x \rightarrow 0} f(x)$, if it exists. DNE

- e) If any limit in this problem does not exist, explain why.

$\lim_{x \rightarrow 0} f(x)$ does not exist because $\lim_{x \rightarrow 0^+} f(x) \neq \lim_{x \rightarrow 0^-} f(x)$.

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Name ANSWER KEY B
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Please show all work neatly. Use of calculators is permitted.
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Answers with no work will receive no credit. A graph alone does not constitute "work."

1. Find each of the following limits, if the limit exists. If the limit does not exist, write DNE.

a) $\lim_{x \rightarrow 3} \frac{x-2}{x^2-5x+6}$ DNE

plug in: $\frac{3-2}{9-15+6} = \frac{1}{0}$

b) $\lim_{x \rightarrow 2} \frac{x-2}{x^2-5x+6} = \lim_{x \rightarrow 2} \frac{x-2}{(x-2)(x-3)} = \lim_{x \rightarrow 2} \frac{1}{x-3} = \frac{1}{-1} = \boxed{-1}$

plug in: $\frac{2-2}{4-10+6} = \frac{0}{0}$ keep going

c) $\lim_{x \rightarrow 5} \frac{x^2-4x-5}{x-5} = \lim_{x \rightarrow 5} \frac{(x-5)(x+1)}{(x-5)} = \lim_{x \rightarrow 5} (x+1) = \boxed{6}$

plug in: $\frac{25-20-5}{5-5} = \frac{0}{0}$ keep going

d) $\lim_{x \rightarrow -1} \frac{x^2-4x-5}{x-5} = \frac{0}{-6} = \boxed{0}$

plug in: $\frac{1+4-5}{-1-5} = \frac{0}{-6}$

e) $\lim_{x \rightarrow 1} \frac{x^5-1}{x-1} = \lim_{x \rightarrow 1} \frac{(x-1)(x^4+x^3+x^2+x+1)}{(x-1)} = 1+1+1+1+1 = \boxed{5}$ or

plug in: $\frac{0}{0}$ keep going: either

x	.9	.99	.999	1	1.001	1.01	1.1
f(x)	4.0951	4.900995	4.99001	-	5.01001	5.101005	6.1051

2. Consider the following function: $f(x) = \begin{cases} x^2+3x, & \text{if } x \geq 0 \\ x-2, & \text{if } x < 0 \end{cases}$

a) Find $\lim_{x \rightarrow -2} f(x)$, if it exists. -4 ($-2 < 0$, so $\lim_{x \rightarrow -2} f(x) = \lim_{x \rightarrow -2} x-2 = -4$)

b) Find $\lim_{x \rightarrow 0^-} f(x)$, if it exists. -2 $\lim_{x \rightarrow 0^-} f(x) = \lim_{x \rightarrow 0^-} x-2 = -2$

c) Find $\lim_{x \rightarrow 0^+} f(x)$, if it exists. 0 $\lim_{x \rightarrow 0^+} f(x) = \lim_{x \rightarrow 0^+} x^2+3x = 0+0 = 0$

d) Find $\lim_{x \rightarrow 0} f(x)$, if it exists. DNE

- e) If any limit in this problem does not exist, explain why.

15 pts. $\lim_{x \rightarrow 0} f(x)$ does not exist because $\lim_{x \rightarrow 0^-} f(x) \neq \lim_{x \rightarrow 0^+} f(x)$.