

Classroom Voting Questions: Precalculus

1.8 Limits

1. Consider the function:

$$f(x) = \begin{cases} 6 & \text{if } x > 9 \\ 2 & \text{if } x = 9 \\ -x + 14 & \text{if } -7 \leq x < 9 \\ 21 & \text{if } x < -7 \end{cases}$$

- (a) $\lim_{x \rightarrow 9^-} f(x) = 2$
(b) $\lim_{x \rightarrow 9^-} f(x) = 5$
(c) $\lim_{x \rightarrow 9^-} f(x) = 6$
(d) $\lim_{x \rightarrow 9^-} f(x) = 14$
(e) $\lim_{x \rightarrow 9^-} f(x) = 21$
2. **True or False:** As x increases to 100, $f(x) = 1/x$ gets closer and closer to 0, so the limit as x goes to 100 of $f(x)$ is 0. Be prepared to justify your answer.
3. **True or False:** $\lim_{x \rightarrow a} f(x) = L$ means that if x_1 is closer to a than x_2 is, then $f(x_1)$ will be closer to L than $f(x_2)$ is. Be prepared to justify your answer with an argument or counterexample.
4. The reason that $\lim_{x \rightarrow 0} \sin\left(\frac{1}{x}\right)$ does not exist is:
- (a) because no matter how close x gets to 0, there are x 's near 0 for which $\sin\left(\frac{1}{x}\right) = 1$, and some for which $\sin\left(\frac{1}{x}\right) = -1$.
(b) because the function values oscillate around 0.
(c) because $\frac{1}{0}$ is undefined.
(d) all of the above
5. $\lim_{x \rightarrow 0} x^2 \sin\left(\frac{1}{x}\right)$
- (a) does not exist because no matter how close x gets to 0, there are x 's near 0 for which $\sin\left(\frac{1}{x}\right) = 1$, and some for which $\sin\left(\frac{1}{x}\right) = -1$.
(b) does not exist because the function values oscillate around 0.

- (c) does not exist because $\frac{1}{0}$ is undefined.
- (d) equals 0
- (e) equals 1
6. You're trying to guess $\lim_{x \rightarrow 0} f(x)$. You plug in $x = 0.1, 0.01, 0.001, \dots$ and get $f(x) = 0$ for all of these values. In fact you're told that for all $n = 1, 2, \dots$, $f\left(\frac{1}{10^n}\right) = 0$. **True or False:** Since the sequence $f(0.1), f(0.01), f(0.001), \dots$ goes to 0, we know that $\lim_{x \rightarrow 0} f(x) = 0$.
7. If $\lim_{x \rightarrow a} f(x) = 0$ and $\lim_{x \rightarrow a} g(x) = 0$, then $\lim_{x \rightarrow a} \frac{f(x)}{g(x)}$
- (a) does not exist.
- (b) must exist.
- (c) can't be determined. Not enough information is given.
8. **True or False:** Consider a function $f(x)$ with the property that $\lim_{x \rightarrow a} f(x) = 0$. Now consider another function $g(x)$ also defined near a . Then $\lim_{x \rightarrow a} [f(x)g(x)] = 0$.
9. If a function f is not defined at $x = a$,
- (a) $\lim_{x \rightarrow a}$ cannot exist.
- (b) $\lim_{x \rightarrow a}$ could be 0.
- (c) $\lim_{x \rightarrow a}$ must approach ∞ .
- (d) none of the above
10. Possible criteria for continuity at a point: *If the limit of the function exists at a point, the function is continuous at that point.* Which of the following examples fits the above criteria but is not continuous at $x = 0$?
- (a) $f(x) = x$
- (b) $f(x) = x^2/x$
- (c) $f(x) = |x|/x$
- (d) None of these show a problem with this criteria.
11. Let $f(x) = 5x^4 + 18x^3 - 2x + 3$. As x gets really big, what becomes the most important (dominant) term in this function?

- (a) $5x^4$
- (b) $18x^3$
- (c) $-2x$
- (d) 3

12. What is

$$\lim_{x \rightarrow \infty} \frac{6x^2 - 5x}{2x^2 + 3}?$$

- (a) 0
- (b) 2
- (c) 3
- (d) 6
- (e) infinity

13. What is

$$\lim_{x \rightarrow \infty} \frac{3x^2 + 5x^3 - 2x + 4}{4x^3 - 5x + 6}?$$

- (a) 0
- (b) $2/3$
- (c) $3/4$
- (d) $5/4$
- (e) infinity

14. What is

$$\lim_{x \rightarrow \infty} \frac{100x^5 - 15x}{x^6 + 3}?$$

- (a) 0
- (b) $5/6$
- (c) 85
- (d) 100
- (e) infinity

15. What is

$$\lim_{x \rightarrow \infty} \frac{x^2 + 2x + 3}{25x - 7}?$$

- (a) 0
- (b) $1/25$
- (c) $3/7$
- (d) 2
- (e) infinity