Classroom Voting Questions: Precalculus

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) $\lim_{x \to 9^-} f(x) = 2$
   (b) $\lim_{x \to 9^-} f(x) = 5$
   (c) $\lim_{x \to 9^-} f(x) = 6$
   (d) $\lim_{x \to 9^-} f(x) = 14$
   (e) $\lim_{x \to 9^-} f(x) = 21$

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.

   (a) True, and I am very confident
   (b) True, but I am not very confident
   (c) False, but I am not very confident
   (d) False, and I am very confident

3. **True or False:** $\lim_{x \to a} f(x) = L$ 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.

   (a) True, and I am very confident
   (b) True, but I am not very confident
   (c) False, but I am not very confident
   (d) False, and I am very confident

4. The reason that $\lim_{x \to 0} \sin\left(\frac{1}{x}\right)$ 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. $\lim_{x\to 0} x^2 \sin\left(\frac{1}{x}\right)$

(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 $\lim_{x\to 0} f(x)$. You plug in $x = 0.1, 0.01, 0.001, \cdots$ and get $f(x) = 0$ for all of these values. In fact you're told that for all $n = 1, 2, \cdots$, $f\left(\frac{1}{10^n}\right) = 0$. **True or False:** Since the sequence $f(0.1), f(0.01), f(0.001), \cdots$ goes to 0, we know that $\lim_{x\to 0} = 0$.

(a) True, and I am very confident

(b) True, but I am not very confident

(c) False, but I am not very confident

(d) False, and I am very confident

7. If $\lim_{x\to a} f(x) = 0$ and $\lim_{x\to a} g(x) = 0$, then $\lim_{x\to a} \frac{f(x)}{g(x)}$

(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 $\lim_{x\to a} f(x) = 0$. Now consider another function $g(x)$ also defined near a. Then $\lim_{x\to a} [f(x)g(x)] = 0$.

(a) True, and I am very confident

(b) True, but I am not very confident

(c) False, but I am not very confident

(d) False, and I am very confident

9. If a function f is not defined at $x = a$,

   (a) $\lim_{x\to a}$ cannot exist.
   (b) $\lim_{x\to a}$ could be 0.
   (c) $\lim_{x\to a}$ 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
$$\lim_{x\to\infty} \frac{6x^2 - 5x}{2x^2 + 3}?$$

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

13. What is
$$\lim_{x\to\infty} \frac{3x^2+5x^3-2x+4}{4x^3-5x+6}?$$

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

14. What is
$$\lim_{x\to\infty} \frac{100x^5-15x}{x^6+3}?$$

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

15. What is
$$\lim_{x\to\infty} \frac{x^2+2x+3}{25x-7}?$$

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

16. Let $f(x) = \dfrac{x^2-4x+3}{x^2-1}$. Evaluate $\lim_{x\to -1^+} f(x)$.

(a) -1
(b) ∞
(c) $-\infty$