BC Calculus - Unit 1 Test Review (Limits)

Evaluate the Limit

1) $\lim_{x \to 0} \frac{\sqrt{x+19}-\sqrt{19}}{x}$

2) $\lim_{x \to -3} \frac{x+3}{x^2+2x-3}$

3) $\lim_{x \to 2^-} \frac{|x-2|}{x-2}$

4) $\lim_{x \to 0} \frac{\frac{1}{x+1}-1}{x}$

5) $\lim_{x \to \infty} \frac{4x^5-2x^2+3}{3x^2+2x^5-x^4}$

6) $\lim_{x \to \infty} x^5 3^{-x}$

7) $\lim_{x \to -3^-} \frac{x^2+3}{x+3}$

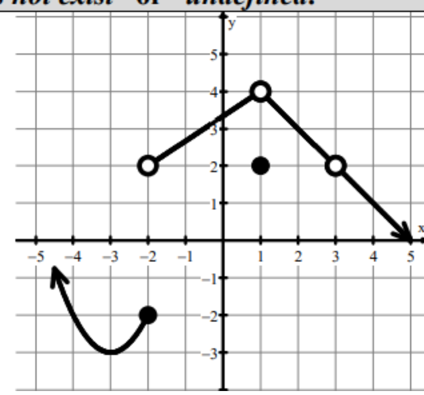
8) $\lim_{x \to 1^+} \frac{x^2+2x+1}{x-1}$

9) Let g and h be the functions defined by $g(x) = -\frac{1}{4}x^2 - \frac{1}{2}x - \frac{9}{4}$ and $h(x) = \sin\left(\frac{\pi}{2}x\right) - 1$. If f is a function that satisfies $g(x) \le f(x) \le h(x)$ for all x, what is $\lim_{x \to -1} f(x)$?

10) Let f be the function defined by $f(x) = \begin{cases} \frac{x^2+8x+12}{x+6}, & x \ne -6 \\ b, & x = -6 \end{cases}$. For what value of b is f continuous at $x = -6$? (support answer with continuity conditions)

Give the value of each statement. If the value does not exist, write "*does not exist*" or "*undefined.*"

11. $\lim_{x \to 3} f(x) =$
12. $\lim_{x \to 1} f(x) =$
13. $f(3) =$
14. $f(-2) =$
15. $\lim_{x \to 2} f(x) =$
16. $\lim_{x \to -2^+} f(x) =$
17. $f(1) =$
18. $\lim_{x \to -2^-} f(x) =$



19) If $f(x) = \begin{cases} \sin x, & x < -\pi \\ \tan x & -\pi < x < \frac{\pi}{4} \\ \cos x, & x \ge \frac{\pi}{4} \end{cases}$, find the following:

a. $\lim_{x \to -\pi^-} f(x) =$

b. $\lim_{x \to -\pi} f(x) =$

c. $\lim_{x \to \frac{\pi}{4}} f(x) =$

d. $f\left(\frac{\pi}{4}\right) =$

20) If $f(x) = \frac{x+3}{x^2-2x-15}$, identify the type of each discontinuity and where it is located.

21) Identify all horizontal asymptotes of $f(x) = \frac{\sqrt{16\quad^{6}+x^3+5x}}{5x^3-8x}$

22)

$$g(x) = \begin{cases} \frac{x+5}{2x-4}, x < 2 \\ 12, x = 2 \\ 2x-5, \ \ 2 < x < 5 \\ 20, x = 5 \\ \frac{-x^2+4}{5-x}, x > 5 \end{cases}$$

Find the following :

$a)\ \lim_{x\to-\infty} g(x) =$	$b)\ \lim_{x\to2^-} g(x) =$	$c)\ \lim_{x\to2^+} g(x) =$
$d)\ \lim_{x\to2} g(x) =$	$e)\ \lim_{x\to5^-} g(x) =$	$f)\ \lim_{x\to5^+} g(x) =$
$g)\ \lim_{x\to5} g(x) =$	$h)\ \lim_{x\to3^+} g(x) =$	$i)\ \lim_{x\to\infty} g(x) =$

23) On the coordinate plane below, sketch a **function graph** with the following characteristics:

a. $\lim_{x\to-\infty} f(x) = 8$

b. $f(-6) = -3$

c. $\lim_{x\to-6} f(x) = 4$

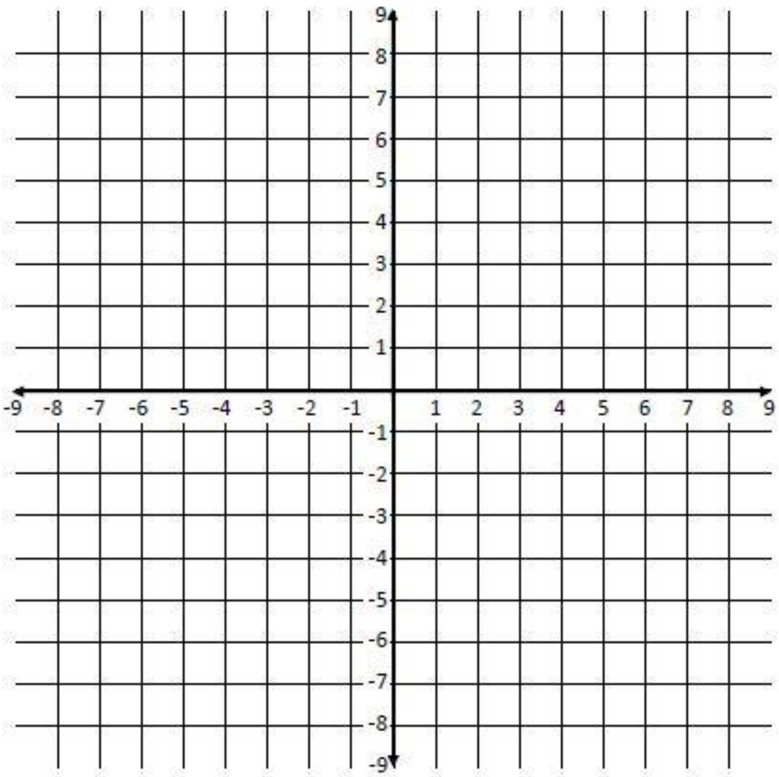
d. $\lim_{x\to-2} f(x) = \infty$

e. $f(3) = 7$

f. $\lim_{x\to3} f(x)$ does not exist

g. $\lim_{x\to3^+} f(x) = 5$

h. $\lim_{x\to\infty} f(x) = -\infty$



24) Find the value of **k** which makes the following piecewise function continuous for all values of x. (Use continuity conditions to justify)

$$f(x) = \begin{cases} 2x + k & if\ x \le -2 \\ kx - 3 & if\ x > -2 \end{cases}$$

25) a) Verify Intermediate Value Theorem (IVT) applies to $f(x) = \frac{x^2+x}{x-1}$ on $\left[\frac{5}{2}, 4\right]$ for $f(c) = 6$

b) Find c-value