

Name: \_\_\_\_\_

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### Calculus H Review Chapter 2

1. List the three criteria for continuity.
2. What is indeterminate form?
3. What is the difference between a step discontinuity and a removable discontinuity?
4. Draw two different scenarios for a function that has a value for  $x = -3$  and no limit.
5. What does the intermediate value theorem state?

Simplify all answers and show all algebra for 6-10

6.  $\lim_{x \rightarrow 2} \frac{x^4 - 11x^3 + 21x^2 - x - 10}{x - 2}$

7.  $\lim_{x \rightarrow 4} \frac{\sqrt{x} + 2}{x - 4}$

8.  $\lim_{x \rightarrow 0} \frac{4 - \sqrt{16 + x}}{x}$

9.  $\lim_{x \rightarrow 2} \frac{\frac{1}{2} - \frac{1}{x}}{2 - x}$

10.  $\lim_{x \rightarrow 0} \frac{(6+x)^2 - 36}{x}$

11. For what value of  $k$  would make the following functions continuous?

a.  $g(x) = \begin{cases} 9 - x^2 & \text{if } x < 2 \\ kx & \text{if } x \geq 2 \end{cases}$

b.  $g(x) = \begin{cases} 3x + 7 & \text{if } x \leq 2 \\ \frac{k}{x} & \text{if } x > 2 \end{cases}$

c.  $g(x) = \begin{cases} kx^2 + x & \text{if } x \leq 6 \\ 10 + \sqrt{x - 2} & \text{if } x > 6 \end{cases}$

12. Where is the function discontinuous?

$$f(x) = \begin{cases} x + 1, & \text{if } x < 1 \\ 4, & \text{if } x = 1 \\ (x - 2)^2 + 1, & \text{if } 1 < x \leq 4 \\ \frac{1}{x - 5} & \text{if } x > 4 \text{ and } x \neq 5 \end{cases}$$

13. Plot the piecewise function

$$f(x) = \begin{cases} x^2 + 1, & \text{if } x < 1 \\ \frac{x^2 - 4}{x - 2}, & \text{if } 1 \leq x \leq 3, x \neq 2 \\ 1, & \text{if } x = 2 \\ 5, & \text{if } 3 < x \leq 5 \end{cases}$$

14.  $f(x) = \frac{1}{x-2} + 3$

Find:  $\lim_{x \rightarrow 2^-} f(x)$        $\lim_{x \rightarrow 2^+} f(x)$

15. Limits involving infinity can be one of two types, which are?

16.  $\lim_{x \rightarrow \infty} \frac{x^2 + 2x + 2}{x - 5}$

17.  $\lim_{x \rightarrow -\infty} \frac{x^2 - 3x - 4}{x^2 - x - 2}$

18.  $\lim_{x \rightarrow 2^+} \frac{x^2 - 3x - 4}{x^2 - x - 2}$

19. How many zeros does  $f(x) = 55x^3 - 60x^2 + 20x - 2$  have in the interval  $[0, 0.6]$ ?

Verify that the Intermediate value theorem applies to the indicated intervals for 20-23

20.  $f(x) = x^2 + 5x + 2$        $[1, 5]$        $f(c) = 26$

21.  $f(x) = \frac{x+1}{x-6}$        $[0, 4)$        $f(c) = -\frac{3}{4}$

22.  $f(x) = \frac{x^2-x}{x-2}$        $[1, 4)$        $f(c) = 6$

23.  $f(x) = x^3 - 2x + 7$        $[-1, 3]$        $f(c) = 11$