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## Test Review Limits

Instructions: Be sure to follow the directions for each section. SHOW WORK! Good luck and have fun-ctions! Calculators are permitted on this test.
(6 points) 1. List the three requirements for a function to be continuous at $x=c$ and give a graphical example of a function failing to be continuous for each reason.
2. (1 point each) Using the graph, evaluate each. (Scale is by 1's)


| a. $\lim _{x \rightarrow 3} g(x)$ | b. $\lim _{x \rightarrow 1} g(x)$ |
| :--- | :--- |
| c. $\lim _{x \rightarrow 0} g(x)$ | d. $\lim _{x \rightarrow-2^{-}} g(x)$ |
| e. $\lim _{x \rightarrow-3} g(x)$ | f. $\lim _{x \rightarrow 4} g(x)$ |
| g. $\lim _{x \rightarrow 1^{+}} g(x)$ | h. $\lim _{x \rightarrow 2} g(x)$ |
| i. $\lim _{x \rightarrow 1^{-}} g(x)$ | I. $f(-2)$ |
| k. $f(-3)$ | n. $f(1)$ |
| m. $f(0)$ | p. $f(4)$ |
| o. $f(3)$ |  |

3. (5 points) Sketch an example of a function with the given attributes.

- $f(1)=7$
- $f(-2)=6$
- The limit as $x$ approaches -2 of $f(x)$ does not exist; however, both one-sided limits exist.
- The limit as $x$ approaches 1 of $f(x)$ is equal to 8 .
- The function is decreasing on $(1, \infty)$

4. (6 points) Consider the following function:

$$
f(x)=\left\{\begin{array}{cc}
a+b x, & \text { if } x>2 \\
3, & \text { if } x=2 \\
b-a x^{2}, & \text { if } x<2
\end{array}\right.
$$

Determine the values of constants $a$ and $b$ so that $\lim _{x \rightarrow 2} f(x)$ exists and is equal to $f(2)$.
5. (8 points) Find the equation of the tangent line to $f(x)=14-3 x^{2}$ at $x=-2$. Show all calculations and include a graph. Use the following equation: $m_{t a n}=\frac{f\left(x_{o}+h\right)-f\left(x_{0}\right)}{h}$
6. (4 points) Let $f(x)=x^{2}+2 x$. What is the average rate of change of $f(x)$ on the interval $[1,3]$ ?
7. (2 points) If the limit as $x$ approaches 2 is 4 , what does that tell you about $f(2)$ ? Explain.
8. (2 points) If $f(2)=4$, what does that tell you about the limit of $f(x)$ as $x$ approaches 2 ? Explain.
9. (2 points) Write, in words, how to say this: $\lim _{x \rightarrow 3} f(x)=4$
10. (12 points) Sketch the graph of $f(x)=\left\{\begin{array}{ll}2 x, & x<2 \\ x^{2}, & x \geq 2\end{array}\right.$ and identify each limit. (Be sure to include a scale)

| a. $\lim _{x \rightarrow 2^{-}} f(x)$ | b. $\lim _{x \rightarrow 2^{+}} f(x)$ |
| :---: | :---: |
| c. $\lim _{x \rightarrow 2} f(x)$ | d. $\lim _{x \rightarrow 1} f(x)$ |

11. (8 points) If an object travels a distance of $s=2 t^{2}-5 t+1$, where $s$ is in feet and $t$ is in seconds, find
(a) the average velocity of the object within the first 10 seconds. Show all calculations and include proper units.
(b) the instantaneous velocity of the object at 3 seconds. Show all calculations and include proper units.
