

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:

$$f(x) = \begin{cases} a + bx, & \text{if } x > 2 \\ 3, & \text{if } x = 2 \\ b - ax^2, & \text{if } x < 2 \end{cases}$$

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 $f(x) = 14 - 3x^2$ at $x=-2$. Show all calculations and include a graph. Use the following equation: $m_{tan} = \frac{f(x_0+h)-f(x_0)}{h}$

6. (4 points) Let $f(x) = x^2 + 2x$. 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 $f(x) = \begin{cases} 2x, & x < 2 \\ x^2, & x \geq 2 \end{cases}$ 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 $s = 2t^2 - 5t + 1$, 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.