

Instructions: Read the entire statement of each problem. Solve each problem carefully and organize your work. Be sure to include units and write your answers in complete sentences where appropriate.

1. (Warm-Up) Find the derivatives of the following functions using the derivative rules:

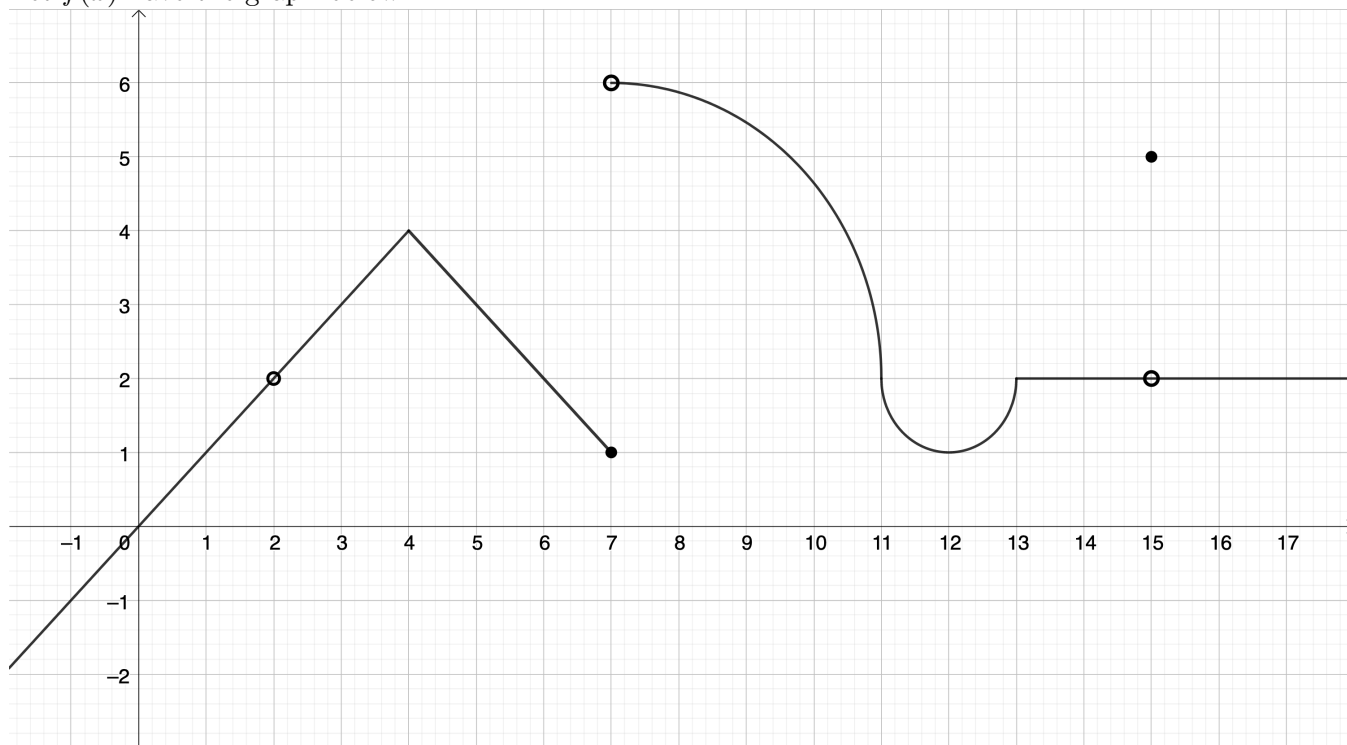
(a) $f(x) = x^5 - 2x + 1$

(b) $g(x) = \sqrt[3]{x} + \frac{7}{x^2}$

(c) $r(x) = 3(4x^2 + 1)^5$

(d) $h(x) = 4\sqrt{8x^3 + 2x}$.

2. Let $f(x)$ have the graph below:



Find the following, if they exist. If they don't briefly explain why.

(i) $\lim_{x \rightarrow 15} f(x)$

(ii) $f(15)$

(iii) $f'(2)$

(iv) $f'(6)$

(v) $\lim_{x \rightarrow 7^+} f(x)$

(vi) $\lim_{x \rightarrow 7^-} f(x)$

(vii) At which values of x is $f(x)$ discontinuous?

(viii) At which values of x is $f(x)$ not differentiable?

3. Using the **LIMIT DEFINITION**, compute $f'(3)$ if $f(x) = 2x^2 - 10x$.
4. Is the function $g(x) = 3x^3 - 10x^2 + 2$ increasing or decreasing when $x = 2$? Hint: determine the sign of the derivative.
5. Find the equation for the tangent line to $h(x) = \sqrt{2x+2}$ at $x = 7$.

6. Draw an example of the graph of a function f that has two points where f is not continuous.
7. Draw an example of a graph of a function g that has a point where g is continuous, but not differentiable.
8. Decide if the following are true or false, and briefly explain:
- (a) For a function $f(x)$, If $f'(3) > 0$ then f is increasing at $x = 3$.
 - (b) For function $g(x)$, if $g'(4)$ is 0, then the derivative of g doesn't exist at $x = 4$.
 - (c) If a function f is continuous at a certain value of x , then it is differentiable at that value of x .
 - (d) For a function $p(x)$, if $p(3)$ doesn't exist then $p'(3)$ doesn't exist either.