Derivative as Function Worksheet

Limit Laws

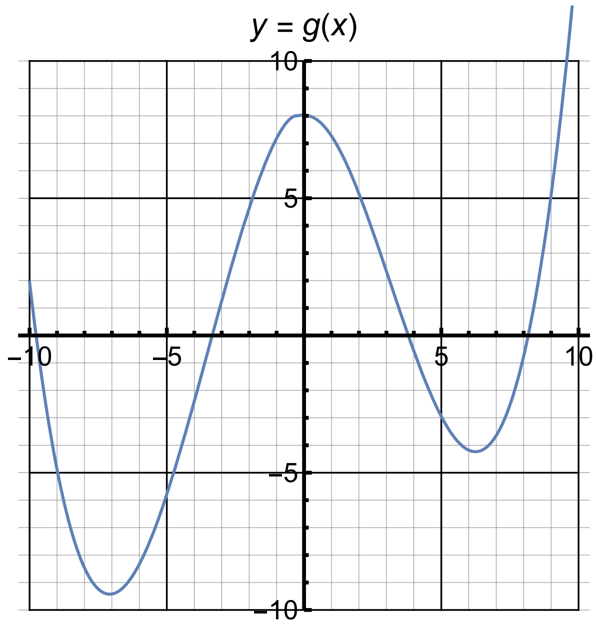
If $\lim_{x\to a} f(x) = M$ and $\lim_{x\to a} g(x) = N$

Sum	$\lim_{x\to a}\left[f(x)+g(x)\right] = M+N$	
Difference	$\lim_{x\to a}\left[f(x)-g(x)\right] = M-N$	
Constant	$\lim_{x\to a}\left[k\cdot f(x)\right] = k\cdot M$	
Product	$\lim_{x\to a}\left[f(x)g(x)\right] = M\cdot N$	
Quotient	$\lim_{x\to a}\left[\frac{f(x)}{g(x)}\right] = \frac{M}{N}$	$N \neq 0$
Power	$\lim_{x\to a}\left[f(x)\right]^n = M^n$	*n* is a positive integer
Root	$\lim_{x\to a}\left[\sqrt[n]{f(x)}\right] = \sqrt[n]{M}$	*n* is a positive integer

1. Using the limit definition of the derivative, $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$, as well as the limit laws, to find the derivative of $f(x) = 3x^2 + x - 5$.

2. Using the limit definition of the derivative, $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$, as well as the limit laws, to find the derivative of $f(x) = \frac{1}{x+5}$.

3. Below is the graph of function $g(x)$.

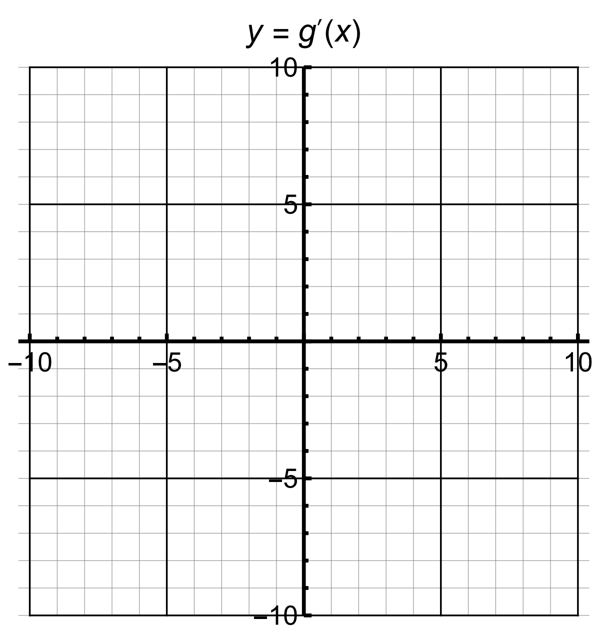


3.1. By using some kind of a straight edge, for each of the following x-values draw an estimate of the tangent line and approximate its slope using rise over run. Each of these slopes is the value of the derivative at that x-value.

x	−8	−7	−6	−5	−4	−3	−2	−1	0
$g'(x)$									

x	1	2	3	4	5	6	7	8
$g'(x)$								

3.2. Plot these $(x, g'(x))$ and connect them to get the graph $y = g'(x)$.



4. (textbook, #9) For each graph that provides an original function y=f(x) in the following figures, your task is to sketch an approximate graph of its derivative function, $y=f'(x)$, on the axes immediately below. View the scale of the grid for the graph of f as being 1×1, and assume the horizontal scale of the grid for the graph of f' is identical to that for f. If you need to adjust the vertical scale on the axes for the graph of f', you should label that accordingly.