Section 2.1 and 2.3 Worksheet

Power and Linear Rules Worksheet

1. Let $f(x) = 2x^3 - 15x^2 + 24x - 10$.

1.1. Compute the derivative $f'(x)$.

1.2. What is the slope of the tangent line when $x = 0$?

1.3. What are the x-values for points on $y = f(x)$ where the slope of the tangent line is 0? (This is NOT the same question as 2.2. That was to find $f'(0)$, while this is to solve $f'(x) = 0$ for x.)

1.4. Using something like Desmos or a graphing calculator, graph $y = f(x)$ for $-1 \le x \le 6$. Sketch the results below along with the points on the graph that correspond to the x-values you got in 2.3.

2. Let $f(x) = x^5$ and $g(x) = \frac{1}{x^5}$.

2.1. What is $f'(x)$ and what is $g'(x)$?

2.2. What are the fourth derivatives of each, $f^{(4)}(x)$ and $g^{(4)}(x)$?

2.3. What are the sixth derivatives of each, $f^{(6)}(x)$ and $g^{(6)}(x)$?

3. Let $f(x) = x^{4/3} - 3x^{2/3}$.

3.1. Compute the derivative $f'(x)$.

3.2. For which values of x is the derivative $f'(x)$ defined?

3.3. Find an equation for the tangent line to $y = f(x)$ when $x = 1$.

3.4. Using something like Desmos or a graphing calculator, graph $y = f(x)$ for $-6 \le x \le 6$ and this tangent line. Sketch the results below.

3.5. Looking at the graph, what behavior do you see where the derivative is undefined?

4. An airplane's height in miles at time t hours is given by the function $h(t) = 5\sqrt{x} - 3\sqrt[3]{x^2}$.

4.1. Write this function as the difference of two power functions.

4.2. What is the function that represents its instantaneous rate of change of height?

4.3. At time $t = 1$ is the plane rising or descending? How fast?

4.4. At time $t = 5$ is the plane rising or descending? How fast?