3.1 Worksheet:
Critical Points and Extrema

1. Let $h(x) = \frac{10(x-2)^{2/3}}{x}$. A computer algebra system gives the derivative as $h'(x) = \frac{10(6-x)}{3x^2(x-2)^{1/3}}$.

1.1. What are the intervals of increase and the intervals of decrease?

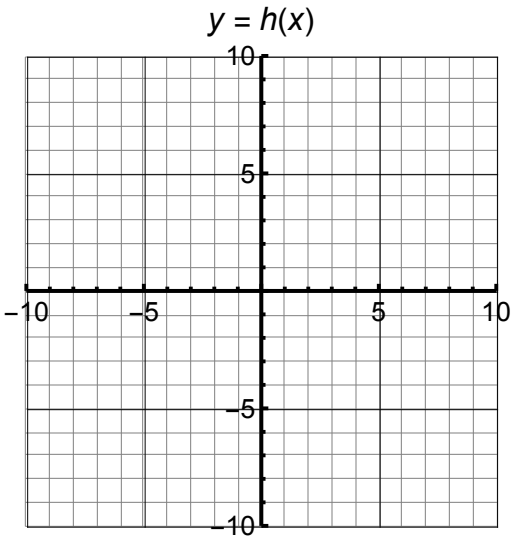
1.2. What is the domain for the original function $h(x)$? What is the domain for the derivative $h'(x)$?

Domain of $h(x)$:

Domain of $h'(x)$:

1.3. Find all the critical numbers of $h(x)$, and for each critical number determine if it is a local maximum, a local minimum, or neither.

1.4. Plot the graph in Desmos or a graphing calculator. Sketch the results below. Does your results in 1.1, 1.2 and 1.3 agree with the graph?



2. Let $f(x) = \frac{(x-1)^{1/3}}{x+2}$. A computer algebra system gives the derivative as $f'(x) = \frac{5-2x}{3(x+2)^2(x-1)^{2/3}}$.

2.1. What are the intervals of increase and the intervals of decrease?

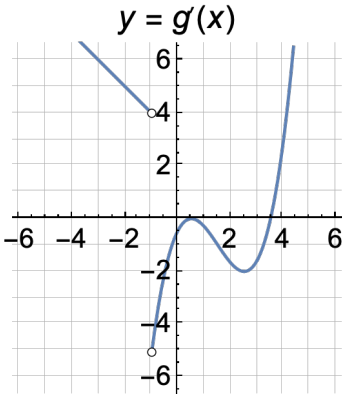
2.2. What is the domain for the original function $f(x)$? What is the domain for the derivative $f'(x)$?

Domain of $f(x)$:

Domain of $f'(x)$:

2.3. Find all the critical numbers of $f(x)$, and for each critical number determine if it is a local maximum, a local minimum, or neither. (Check your results with a graph from Desmos or a graphing calculator. Do they agree?)

3. Function $g(x)$ has domain $(-\infty, \infty)$. The graph shown below is of the derivative $g'(x)$ (NOT $g(x)$). However, use the graph to answer questions about the original function $g(x)$.



3.1. What are the intervals of increase for $g(x)$. (What does that mean for $g'(x)$?)

3.2. What are the intervals of decrease for $g(x)$. (What does that mean for $g'(x)$?)

3.3. Find all the critical points for $g(x)$, and for each one determine if it is a local maximum, a local minimum, or neither.