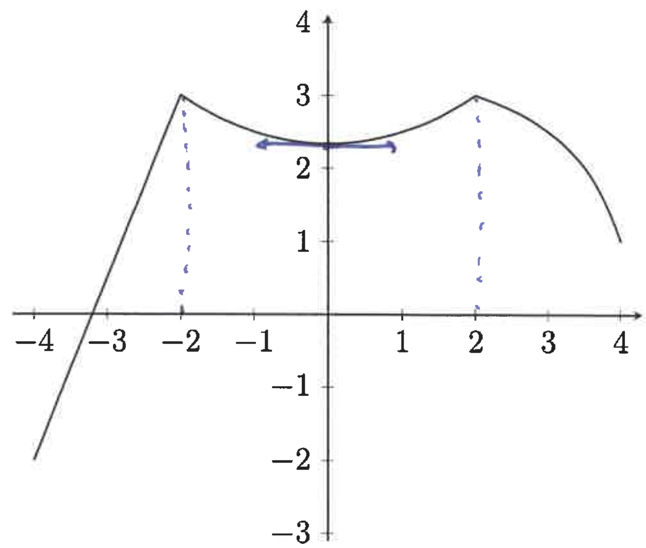
Math 141 Worksheet 4 Name: Key

In this worksheet you'll practice getting information about a derivative from the graph of a function, and vice versa. At the end, you'll match some graphs of functions to graphs of their derivatives.

If $f(x)$ is a function, then remember that we define $f'(x) = \lim_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$.

If this limit exists, then $f'(x)$ is the slope of the tangent line to the graph of f at the point $(x, f(x))$.

1. To the right is the graph of a function $f(x)$. Use the graph to answer the following.



(a) Are there any values x for which the derivative $f'(x)$ does NOT exist?

$-2, 2$

(b) Find any values x for which $f'(x) = 0$.

$x = 0$

(c) This particular function f has an interval on which its derivative $f'(x)$ is constant. What is this interval? What does the derivative function look like there? Estimate the slope of $f(x)$ on that interval.

On $(-4, -2)$ f' is constant. The function looks like a line.

$f'(x)$ on this interval is around $\frac{5}{2}$ $\left(= \dfrac{3-(-2)}{-2-(-4)} \right)$

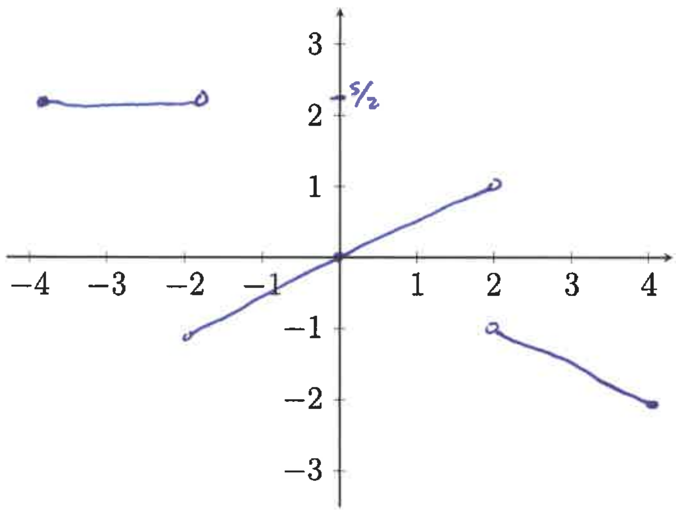
(d) On which interval or intervals is $f'(x)$ positive?

$(-4, -2) \cup (0, 2)$

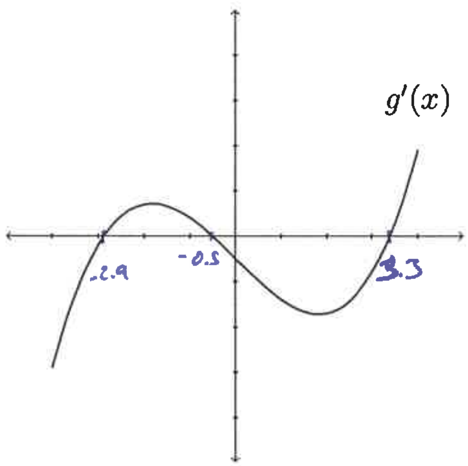
(e) On which interval or intervals is $f'(x)$ negative?

$(-2, 0) \cup (2, 4)$

(f) Now use all your answers to the questions to help you sketch a graph of the derivative function $f'(x)$.



2. Below is a graph of a derivative function $g'(x)$ Assume this is the entire graph of $g'(x)$. Use the graph to answer the following questions about the original function $g(x)$.



(a) On which interval or intervals is the original function $g(x)$ increasing?

$(-2.9, -0.5) \cup (3.3, 4)$

(b) On which interval or intervals is the original function $g(x)$ decreasing?

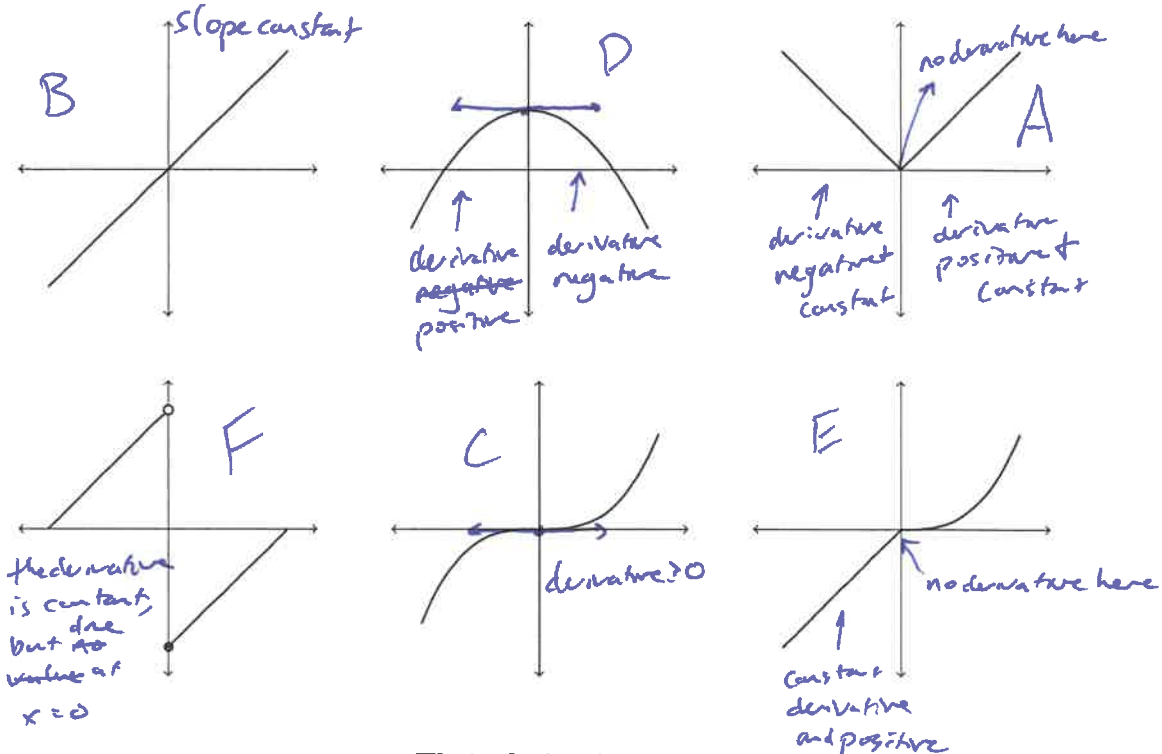
$(-4, -2.9) \cup (-0.5, 3.3)$

(c) Now suppose $g(0) = 0$. Is the function $g(x)$ ever positive? That is, is there any x so that $g(x) > 0$? How do you know?

yes! At $x=0$, we know that $g(x)$ is decreasing. This means that right before $x=0$, $g(x)$ had to be positive so it could decrease to 0 at $x=0$.

3. Six graphs of functions are below, along with six graph of derivatives. Match the graph of each function with the graph of its derivative.

Original Functions:



Their derivatives: