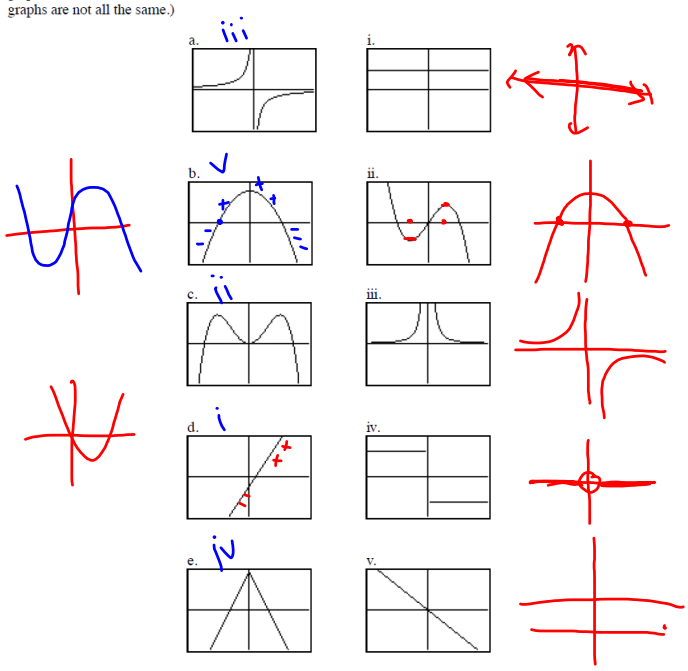
Graphs of f and f'

1. In the left column below are graphs of several functions. In the right-hand column - in a different order - are graphs of the associated derivative functions. Match each function with its derivative. (Note: The scales on the graphs are not all the same.)



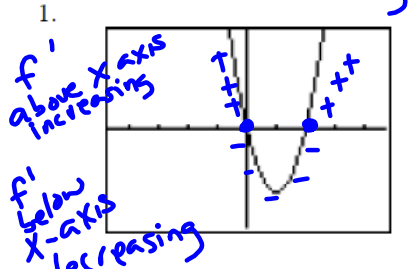
2.(a) Sketch a graph of the derivative of each function labeled (i) - (v) in the right column of the preceding problem.

(b) (Optional!) For each function labeled (a) - (e) in the left column of the preceding problem, sketch a graph of a function whose derivative is the function shown.

The second question we wanted to answer was: **What does the derivative f' tell us about f?**

Examples: Below is the graph of f', the derivative of a function f.

1.



Slopes

On what interval(s) is the function f

a. increasing? $(-\infty, 0)\ (2, \infty)$ Where f' is positive

b. decreasing? $(0, 2)$ Where f' is negative

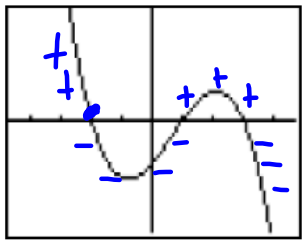
At what x-value does f have a

c. maximum? 0 d. minimum? 2

Where f changes from increasing to decreasing

or Where f' changes from positive to negative

2.



On what interval(s) is the function f

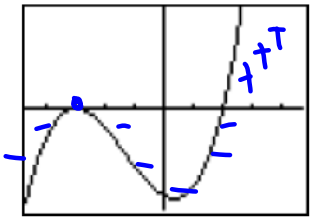
a. increasing? $(-\infty,-2)\ (2,3)$

b. decreasing? $(-2,1)\ (3,\infty)$

At what x-value does f have a

c. maximum? $-2, 3$ d. minimum? 1

3.



On what interval(s) is the function f

a. increasing? $(2,\infty)$

b. decreasing? $(-\infty,-3)\ (-3,2)$

At what x-value does f have a

c. maximum? $-$ d. minimum? 2

function

Using table values and applying derivative rules pg. 2

Two functions, $f(x)$ and $g(x)$, are continuous and differentiable for all real numbers. Some values of the functions and their derivatives are given in the following table.

x	0	1	2	3	4
$f(x)$	$\frac{1}{2}$	$\frac{1}{3}$	1	-1	3
$g(x)$	-2	1	$-\frac{1}{2}$	2	$-\frac{1}{3}$
$f'(x)$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{1}{4}$	0	$-\frac{4}{5}$
$g'(x)$	-1	$\frac{2}{3}$	-4	-3	$-\frac{1}{3}$

Based on the table, calculate the following:

(a) $\frac{d}{dx}(f(x)+g(x))$, evaluated at $x = 4$

$f'(4)+g'(4)$

$-\frac{4}{5}+-\frac{1}{3}=\frac{-12}{15}-\frac{5}{15}=\frac{-17}{15}$

$3+-\frac{1}{3}=2\frac{2}{3}$

(b) $\frac{d}{dx}(f(x)g(x))$, evaluated at $x = 1$

Product Rule

$f(1)g'(1)+g(1)f'(1)$

$\left(\frac{1}{3}\right)\left(\frac{2}{3}\right)+(1)\left(\frac{5}{3}\right)=\frac{17}{9}$

$\frac{2}{9}+\frac{5}{3}=\frac{2}{9}+\frac{15}{9}$

(c) $\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right)$, evaluated at $x = 0$

Quotient Rule

$\frac{g(0)f'(0)-f(0)g'(0)}{(g(x))^2}=\frac{-2\left(\frac{3}{2}\right)-\frac{1}{2}(-1)}{4}=\frac{-3+\frac{1}{2}}{4}=\frac{-\frac{5}{2}}{4}$

$=-\frac{5}{2}\cdot\frac{1}{4}=-\frac{5}{8}$

x	0	1	2	3	4
$f(x)$	$\frac{1}{2}$	$\frac{1}{3}$	1	-1	3
$g(x)$	-2	1	$-\frac{1}{2}$	2	$-\frac{1}{3}$
$f'(x)$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{1}{4}$	0	$-\frac{4}{5}$
$g'(x)$	-1	$\frac{2}{3}$	-4	-3	$-\frac{1}{3}$

** (d) $\frac{d}{dx}(f(g(x)))$, evaluated at $x = 3$

$f'(g(x))\cdot g'(x)$ Chain Rule

$f'(g(3))\cdot g'(3)$

$f'(2)\quad -3$

$\frac{1}{4}\quad -3=-\frac{3}{4}$

$(0)(-3)=0$