

Name Answer Key

Section 2.8

Five things we can tell from  $f'$  and  $f''$ :

1. If  $f'(x) > 0$  on an interval, then  $f$  is increasing on the interval.

$f' + \quad f \uparrow$

2. If  $f'(x) < 0$  on an interval, then  $f$  is decreasing on the interval.

$f' - \quad f \downarrow$

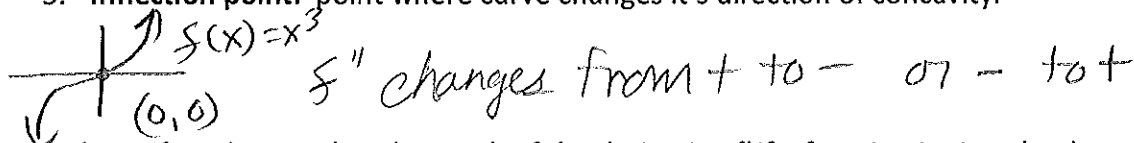
3. If  $f''(x) > 0$  on an interval, then  $f$  is concave upward on that interval.

$f'' + \quad f \cup$

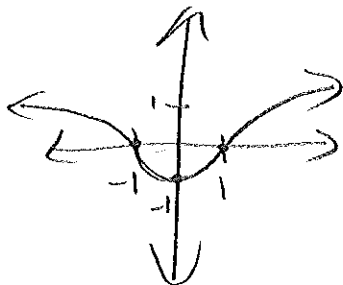
4. If  $f''(x) < 0$  on an interval, then  $f$  is concave downward on that interval.

$f'' - \quad f \cap$

5. **Inflection point:** point where curve changes it's direction of concavity.



Example 1: If it is known that the graph of the derivative  $f'$  if a function is given by the graph:

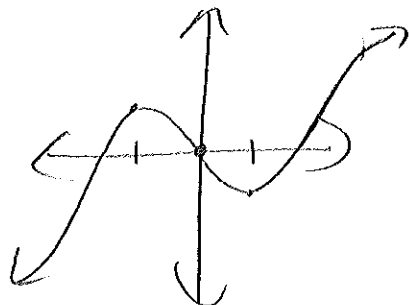


- a. What can we say about  $f$ ?

$f \uparrow (-\infty, -1) \text{ and } (1, \infty)$

$f \downarrow (-1, 1) \quad f \cup (0, \infty) \quad f \cap (-\infty, 0)$

- b. If it is known that  $f(0)=0$ , sketch a possible graph of  $f$ .

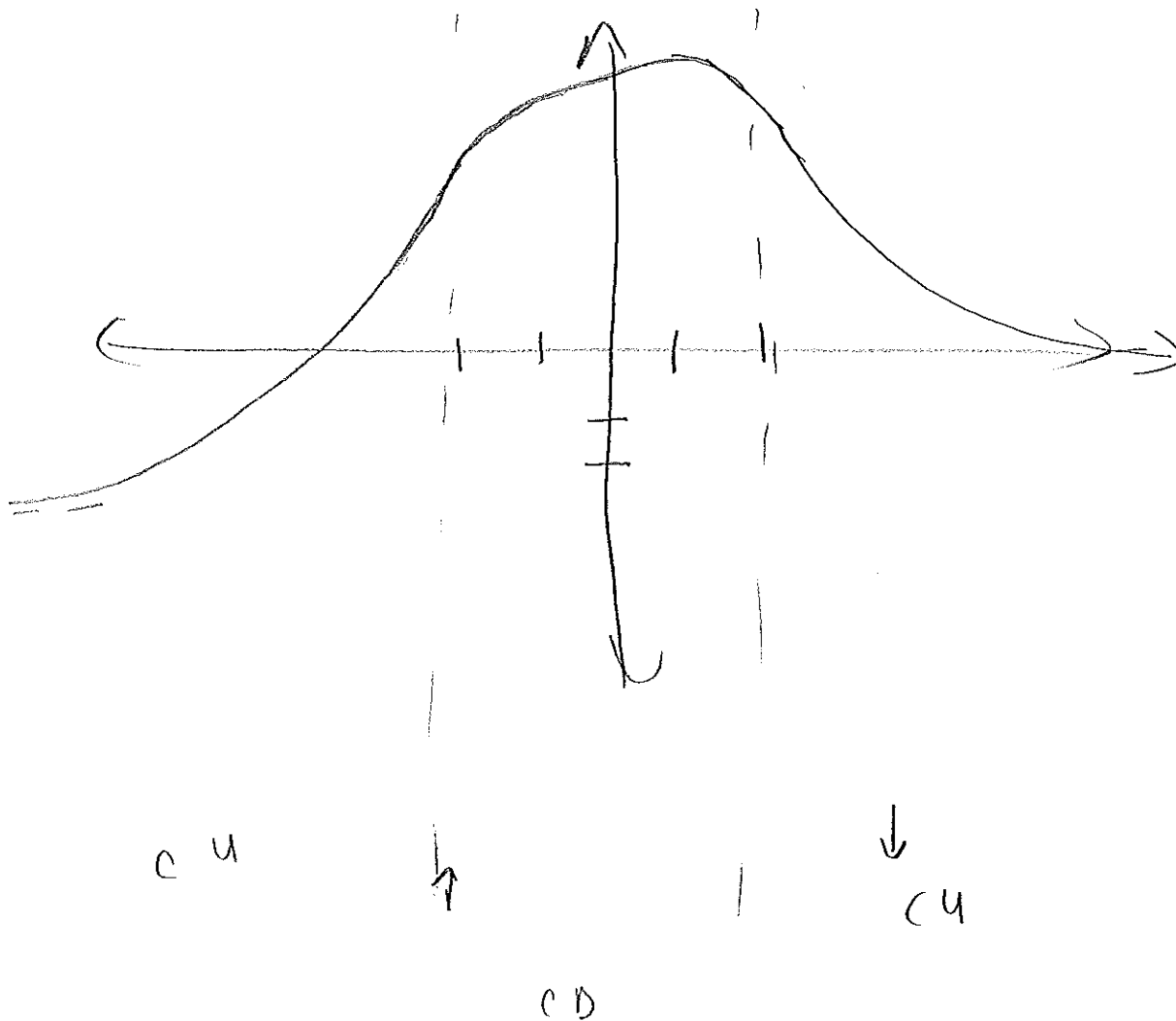


Example 2: Sketch a possible graph of a function  $f$  that satisfies the following conditions:

(i)  $f'(x) > 0$  on  $(-\infty, 1)$ ,  $f'(x) < 0$  on  $(1, \infty)$

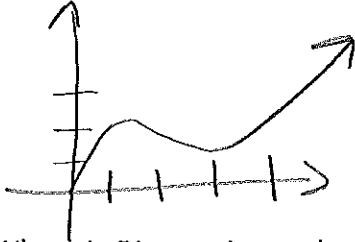
(ii)  $f''(x) > 0$  on  $(-\infty, -2)$  and  $(2, \infty)$ ,  $f''(x) < 0$  on  $(-2, 2)$

(iii)  $\lim_{x \rightarrow -\infty} f(x) = -2$ ,  $\lim_{x \rightarrow \infty} f(x) = 0$



**Antiderivative:** of  $f$  is a function  $F$  such that  $F' = f$ .

Example 3: Let  $F$  be an antiderivative of the function  $f$  whose graph is given.



a. Where is  $F$  increasing or decreasing?

$f \uparrow \quad f' + \quad \text{so } (0, \infty)$

b. Where is  $F$  concave upward or concave downward?

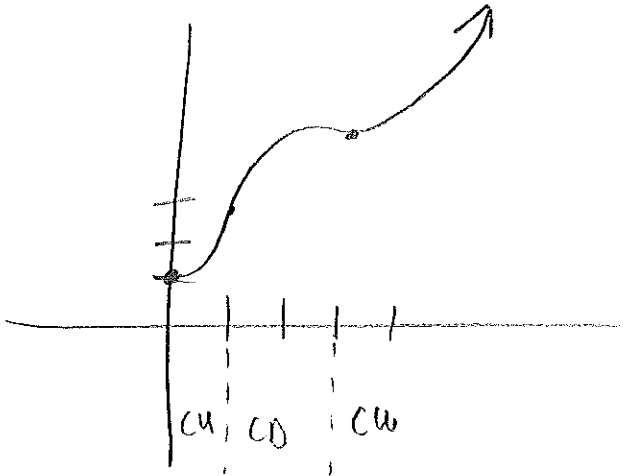
$f \text{ CU} \quad f'' + \rightarrow f' \uparrow \quad (0, 1) \quad (3, \infty)$

$f \text{ CD} \quad f'' - \rightarrow f' \downarrow \quad (1, 3)$

c. At what values of  $x$  does  $F$  have an inflection point?

$x = 1$  and  $x = 3$

d. If  $F(0) = 1$ , sketch the graph of  $F$ .



Homework day 1: Page 162 (1-5, 8, 10)

Homework day 2: Page 162 (12, 14-23, 28-31)