

## Chapter 2.5: The Second Derivative

### Calculus I

College of the Atlantic. Winter 2021

1. Laura says:

I feel bad today, but I'm feeling better than yesterday, and I seem to be improving faster and faster.

Let  $f(t)$  be Laura's health as a function of time. Based on her statement, what can you say about the signs of  $f(t)$ ,  $f'(t)$ , and  $f''(t)$ ?

2. Representative Michaud says:

The defense budget will increase this year, but not by as much as it increased last year.

Let  $B(t)$  be the defense budget as a function of time. Based on Congressman Michaud's remarks, what can you say about the signs of  $B'(t)$  and  $B''(t)$ ?

3. Let  $f(t)$  be the number of inches of rain that has fallen since midnight, where  $t$  is the time in hours. Interpret the following in practical terms, giving units.

- (a)  $f(10) = 1.4$
- (b)  $f'(1) = 0.1$
- (c)  $f''(10) = -0.2$
- (d)  $f^{-1}(1) = 3$
- (e)  $(f^{-1})'(1.4) = 3$

4. A function (not its derivative) is plotted in Fig. 1.

- (a) For what values of  $x$  is  $f(x)$  positive?
- (b) For what values of  $x$  is  $f(x)$  negative?
- (c) For what values of  $x$  is  $f'(x)$  positive?
- (d) For what values of  $x$  is  $f'(x)$  negative?
- (e) For what values of  $x$  is  $f''(x)$  positive?
- (f) For what values of  $x$  is  $f''(x)$  negative?

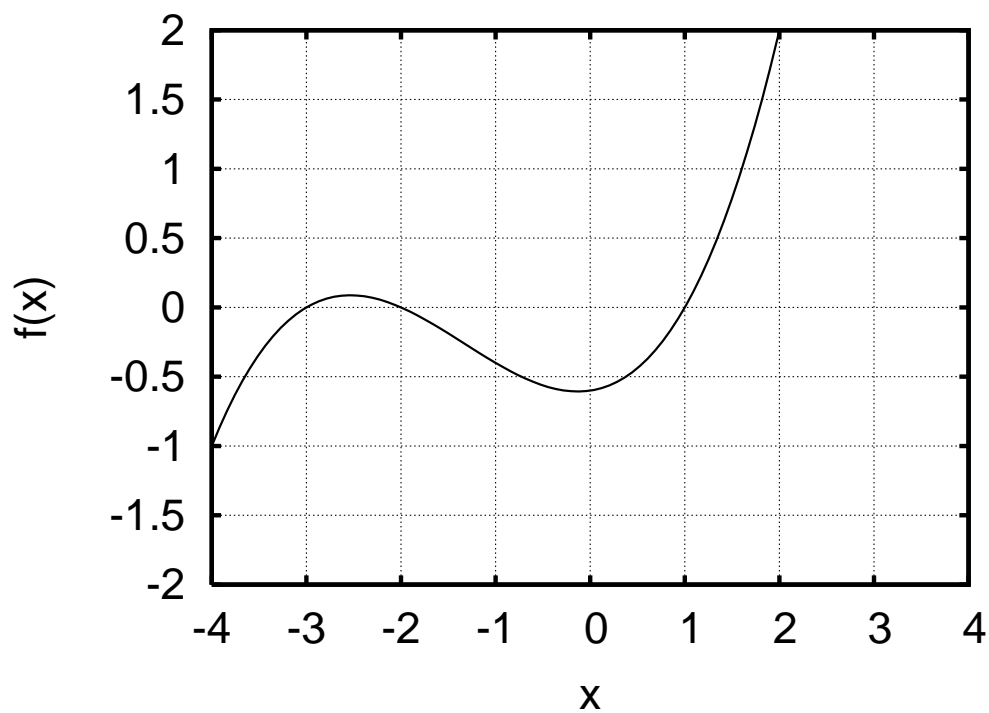


Figure 1: A plot of a function  $f(x)$ .