

# Calculus 120, Notes for Exam 1

notes by Tim Pilachowski

1) It was the best of times, it was the worst of times.

Things was real good, things was turribel.

Just as in any other class, you have to use the vocabulary correctly and make the meaning of your answers clear. Mathematics has its own "grammar".

2) There are three levels of information.

$f(x) \Rightarrow$   $(x, y)$  points on the curve, graph

$f'(x) \Rightarrow$  rate of change, slope of the curve, maximum/minimum

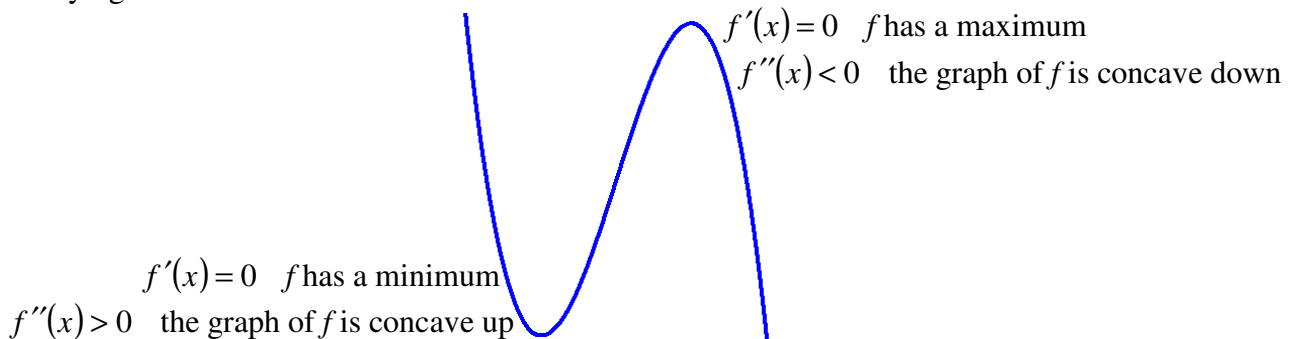
$f''(x) \Rightarrow$  concavity of the curve, points of inflection

3a) You need to know and use the vocabulary of calculus correctly.

$f'(x) > 0$ ,  $f'(x)$  positive, means the function  $f$  is increasing. (It is incorrect to state that  $f'$  is increasing.)

$f'(x) < 0$ ,  $f'(x)$  negative, means the function  $f$  is decreasing. (It is incorrect to state that  $f'$  is decreasing.)

3b) identifying maximum and minimum



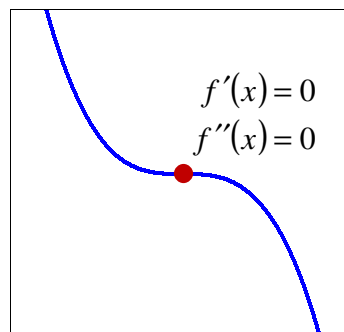
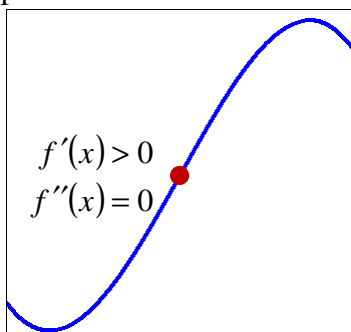
4a) You need to know and use the vocabulary of concavity correctly.

$f''(x) > 0$ ,  $f''(x)$  positive, means the graph of  $f$  is concave up. (It is incorrect to state that  $f''$  is concave up.)

$f''(x) < 0$ ,  $f''(x)$  negative, means the function  $f$  is decreasing. (It is incorrect to state that  $f''$  is concave down.)

$f''(x) = 0$ ,  $f''(x)$  equals zero, means the graph of  $f$  may have a point of inflection. (It is incorrect to state that  $f''$  is a point of inflection.)

4b) identifying points of inflection



At a point of inflection the first derivative could be anything: negative, zero, or positive.

- 5) Don't switch from small letters to capital, or vice versa. If the function is  $f$ , don't write  $F$ .  
If the variable is  $x$ , don't write  $X$ .  
A possible function is  $T(t)$ , Temperature as a function of time.
- 6) If the question on your exam asks you to ““Explain how you know”, avoid writing phrases such as “...because it is...”.  
Be specific in identifying what you mean by “it” – the function? the graph? the slope? the first derivative? the second derivative?
- 7) In answering word problems (applications), it will be important to distinguish between amounts (the function itself) and a rate of change (the derivative of the function).