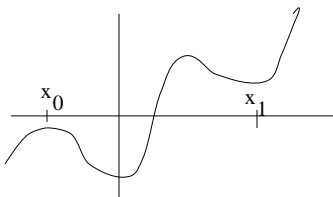


9. (4 points) Explain either why the following statement is always true or show a function for which it is false.

“If  $f$  is a differentiable function defined for all  $x$  and if  $f$  has a local maximum at  $x_0$  and a local minimum at  $x_1$ , then  $f(x_0) \geq f(x_1)$ .”

False. One example is given by the following graph.



10. (5 pts) Upon returning home this summer, you meet a good friend who is just now graduating from high school. He has done very well in precalculus and has a good understanding of the graphs, tables, and formulas that a good student in precalculus should know. He is planning to come to U-M next year and will take Math 115. He has heard that one of the basic concepts in 115 is something called a derivative.

In the space below, explain what you would say to give your friend a good idea of what the derivative means, illustrating this in as many ways as you believe will help your friend understand the concept.

Solution: There are many good answers to this question. They may include ideas of

- slope of tangent or slope of a curve at a point
- instantaneous rate of change
- discussion of velocity vs. position at time  $t$ .
- table of values with appropriate discussion
- the definition as the limit of a difference quotient.

Note: strictly a formula (e.g.  $f(x) = x^3, f'(x) = 3x^2$ ) or only the limit definition without further explanation is not sufficient to receive full credit.