

Math 16A, Fall 2000, Professor Harrison  
Quiz #6 (mock quiz), 27 October

Name\_\_\_\_\_

GSI\_\_\_\_\_Section\_\_\_\_\_

Instructions: You have 35 minutes in which to answer the questions on BOTH SIDES of this quiz. Please read the questions carefully; no credit will be given for answering a different question than the one stated. (Actually, no credit will be given at all, but read the questions carefully, anyway.) No calculators, notes, or other references may be used.

1. (a) (0 points) Is the following statement True or False? (circle one):

If  $f : \mathbb{R} \rightarrow \mathbb{R}$  is a smooth function and  $f(x) > 0$  for all real numbers  $x$ , then  $f''(x) \geq 0$  for all real numbers  $x$ .

(b) (8 mock points) If you said it was true, explain why. (Don't just repeat the statement and then say it must be true!) If you said it was false, come up with a specific counterexample (formula or graph) which disproves it.

2. (8 mock points) There is an important function in statistics which is only defined in terms of its derivative:  $h'(x) = ae^{-x^2}$ , where  $a$  is a positive constant, and  $h(0) = 0$ . The actual function  $h(x)$  cannot be written down using anything we have learned, but we can still answer many questions about  $h(x)$  just by knowing its derivative and the value of the function at zero.

(a) When is  $h(x)$  increasing?

(b) When is  $h(x)$  concave upwards?

(c) Is  $h(-1)$  positive or negative?

(d) At what points does  $h(x)$  have local maxima or minima?

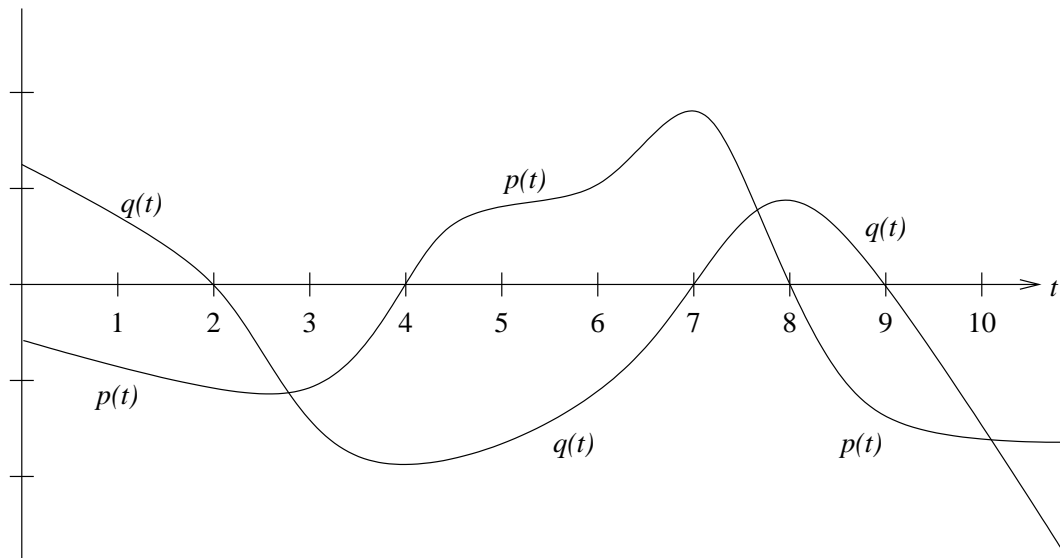


FIGURE 1.  $m'(t)$  and  $m''(t)$

3. (8 mock points) The mercury concentration in a certain lake is given by a function  $m(t)$ , where  $t$  is the number of years since January 1990. Figure 1 above does NOT show  $m(t)$ ; instead, it shows the first and second derivatives,  $m'(t)$  and  $m''(t)$ .

- (a) Which one is  $m''(t)$ : the function labelled  $p(t)$  or the function labelled  $q(t)$ ?
- (b) Did the concentration of mercury increase or decrease from January 1998 to January 1999?
- (c) At  $t = 7$ , is the graph of  $m(t)$  concave up, concave down, or neither?
- (d) Name any times at which there was a local minimum in the mercury concentration.
- (e) (extra mock credit) At what time between January 1990 and the present was the mercury concentration the very worst (highest)?