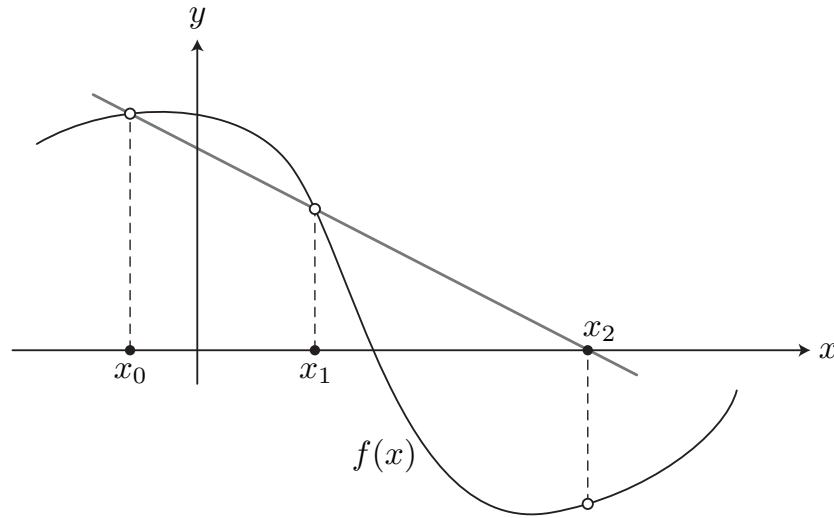


**Physics 234: Quiz 5**  
Monday, March 14, 2011

Student's Name: \_\_\_\_\_

All three questions refer to the figure below.



1. Which of the following is a correct statement about the straight line passing through  $(x_0, f(x_0))$  and  $(x_1, f(x_1))$ ?

- (a) Its intercept with the horizontal axis at  $x_2$  is a better approximation to the root of  $f$  than either  $x_0$  or  $x_1$ .
- (b) Its slope is a good approximation to  $f'((x_0 + x_1)/2)$  [with errors at  $O(x_1 - x_0)^2$ ]
- (c) As  $x_1 \rightarrow x_0^+$ , the approximation  $f'(x_0) \approx (f(x_1) - f(x_0))/(x_1 - x_0)$  becomes more accurate and the numerical precision with which it can be computed in a floating-point scheme increases.
- (d) Its equation in Lagrange form is

$$f(x_0) \left( \frac{x - x_0}{x_1 - x_0} \right) + f(x_1) \left( \frac{x - x_1}{x_0 - x_1} \right).$$

- (e) It must intersect  $f(x)$  an odd number of times.

2. Interpret the diagram as the initial step of the secant method. Make the geometric construction for the next iteration and identify the point  $x_3$ . (Draw one straight line and one solid dot directly on the figure.)

3. Suppose that where  $f(x)$  crosses the horizontal axis in the figure is the only root of  $f$ . Is the secant method sequence  $(x_0, x_1, x_2, x_3, \dots)$  guaranteed to converge to that root for arbitrary initial guesses  $x_0$  and  $x_1$ ?

- (a) true
- (b) false