| 2/21/2006 | MATH405 Numerical Analysis | Name: |
|--------------|----------------------------|-------------------|
| Dr. Lunsford | Quiz 4 | (20 Points Total) |

Please write all calculator approximations to the accuracy of your calculator display.

I. Let $f(x) = x^6 - x - 1$. Below you are given a portion of the graph of f. Please answer the following: (9 points total)

(a) Complete three iterations of Newton's method using the starting point $x_0 = 0$. Clearly indicate the

values of x_1 , x_2 , and x_3 . (5 points)



(b) <u>Graphically represent</u> how the values of x_1 , x_2 , and x_3 are found using the graph of f above (you may want to get a straight edge from Dr. L. or another math prof.). (4 points)

| II. Use the axes to your right to draw the graph of a function f that satisfies | | |
|---|---|--|
| the following (DO NOT try to find a function rule!): (4 points) | | |
| (a) $\int f x defined and differentiable for all x.$ | | |
| (b) f has a unique positive zero, say α . | | |
| (c) Newton's method will converge for all initial starting points, x_0 , such | | |
| that $x_0 > \alpha$. | | |
| (d) Newton's method will diverge for all initial starting points, x_0 , such that | | |
| $x_0 < 0$ | | |
| - | | |
| III. Let $f(x) = 2^x$. Please answer the following: (7 points total) | I | |

(a) Give the unsimplified form of the LaGrange polynomial for f that passes through the nodes with x-coordinates $x_0 = 0$, $x_1 = 1$, and $x_2 = 2$. (4 points)

(b) Use the LaGrange polynomial computed in part (a) to approximate $\sqrt{2}$. What are the absolute and relative errors in your approximation (use your calculator approximation of $\sqrt{2}$ as the exact value of $\sqrt{2}$). (3 points)