

MATH 1351 TI-85 EXERCISE XI
Lab exploration involving Newton's method

Name: _____ SID: _____

The basic question we wish to consider is this: How close to 0 must the initial guess be to guarantee that Newton's method applied to $y = \sin(\pi x)$ converges to 0? To investigate this question first attach a neat and large sketch of the graph of $y = \sin(\pi x)$, then complete the following table. The left column consists of initial guesses, in the right column place the corresponding roots found by applying Newton's method with the given initial value of x . For each of the initial values for x observe where the tangent line appears to cross the x -axis. (Recall that you can draw the tangent lines on your TI-85 graph.) Use this observation to fill in the right column.

Initial x	Root via Newton	Observation/Comments
.1	_____	_____
.2	_____	_____
.3	_____	_____
.37	_____	_____
.38	_____	_____
.39	_____	_____
.3905	_____	_____
.391	_____	_____
.4	_____	_____
.45	_____	_____
.46	_____	_____
.47	_____	_____
.48	_____	_____
.49	_____	_____
.499	_____	_____
.5	_____	_____

Explain what happens between .3905 and .391 and why. _____

What do you expect to happen just to the right of .5? Explain. _____

Now consider the function $y = \sqrt{\text{abs } x}$. Attach a sketch of the graph of this function. Obviously the only root is at $x = 0$. What happens if you use Newton's method on this function with initial guess $x = .1$? _____, with initial guess .01? _____ with initial guess -.1? _____ How close to 0 must the initial guess be for Newton's method to converge to the root of $y = \sqrt{\text{abs } x}$? _____ Attach an explanation of what is going on here using your graph. Now attach an analytic explanation.