Writing Project
Efficient Estimation

Solve the problems given below, then write the essay as directed. The final result should be a neat, well written, essay describing what you have learned. It may be handwritten, but it must be very neat and readable. Include the calculations as an appendix to the paper. Calculators and computer algebra systems may be used for the computations and producing the graphs. The grading criteria are listed on the class web sites.

Analysis of the Issue

$$f(x) = 2\cos(x) - x.$$

1. Basic calculations
   (a) Calculate $f'(x)$
   (b) Calculate $f''(x)$
   (c) Find the increasing and decreasing intervals of $f(x)$.
   (d) Find the concave up and concave down intervals of $f(x)$.
2. Using the Newton-Raphson Method
   For each of the following initial guesses follow the directions below.
   $c_0 = 0$, $c_0 = -1$, $c_0 = 3$
   (a) Graph the function. Label the extrema and inflection points.
   (b) Calculate the slope of the first tangent line.
   (c) Graph the tangent line on your labeled function graph.
   (d) Calculate the next estimate based on this.
   (e) Perform the next nine (9) steps of the Newton-Raphson method.
3. Conclusions
   (a) Does choosing an x value close to the root guarantee a quick solution?
   (b) Which side of a relative extreme point would work best for a tangent line?
   (c) Is a tangent line with a steep or shallow slope better? Why?
   (d) How do you find steep or shallow slopes?
   (e) Using the terminology of derivatives describe a good interval for an initial guess.

Description of the Issue

Based on the evidence of the examples and your answers to the conclusion questions, write an essay about effective, initial guesses for the Newton-Raphson method for finding roots.