UNIVERSIDAD PILOTO DE COLOMBIA

Numerical Methods TIC
HOMEWORK III

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Display all the iterations. Use the fixed point iteration and Steffensen's method.

1. Find the slope of the tangent line to the curve $y = -\sin x$, $\pi/2 \leq x \leq 3\pi/2$ which passes through the origin.

2. Investigate the fixed point(s) of the function

$$g(x) = \frac{1}{e^{-x}-1} + \frac{1}{e^{x}-1} + 1.$$

   What is the value of g' at the fixed point(s)?

3. Consider the function $f(x) = e^x - (3x+2) = 0$, which can be rearranged into the following three forms:

   a) $x = e^x - (2x+2)$

   b) $x = (e^x - 2)/3$

   c) $x = \ln(3x+2)$

   Solve for the positive root, with $p_0 = 1{,}0$.

4. If $f(x) = x^2 + 2x - 1 = 0$, one form of $g(x)$ is $1/(x+2)$.

   a) How many iterations are needed to attain a tolerance value of 10^{-7}, starting with $p_0 = 1{,}0$?

   b) The function has a second root. Will this $g(x)$ converge to it? If not, find another rearrangement that does.