Math 131 - Ex Cred

April 23, 2020

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary. You must work individually on this assignment. The assignment is due no later than April 28.

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1. (2 points) Use Newton's method, starting with $x_0 = -1$, to approximate the solution of the equation $x = \cos x$. Which one of these numbers is closest to your value of x_2? (Show work for credit.)

   (a) 0.75

   (b) 2.98

   (c) 8.72

   (d) -0.51

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

$f'(x) = 1 + \sin x$

$$x_{n+1} = x_n - \frac{x_n - \cos x_n}{1 + \sin x_n}$$

$x_0 = -1$, $x_1 = 8.7162$, $x_2 = 2.9761$

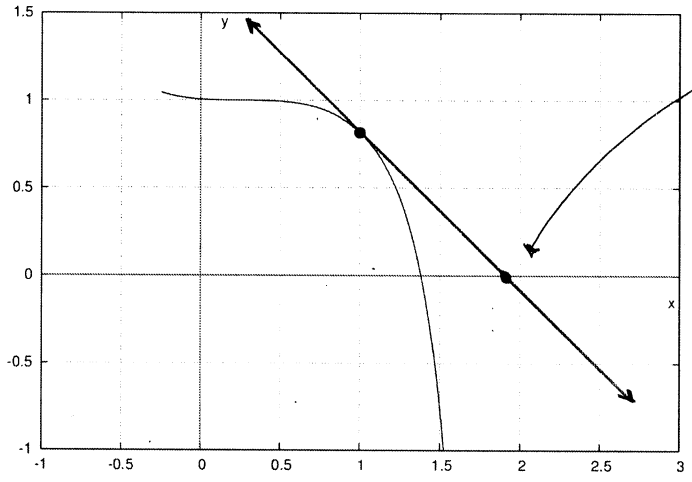
2. (1 point) The graph of $y = f(x)$ is shown below. Suppose you use Newton's method, starting with $x_0 = 1$, to approximate a solution of $f(x) = 0$. Which one of the following numbers would be closest to x_1? (Explain or show work.)

   (a) 1.9

   (b) 1.35

   (c) 2.5

   (d) 1.0



Looks close to 1.9

3. (3 points) Consider the function $f(x) = x^3 - 16x + 32$, and suppose you wish to find a solution of $f(x) = 0$.

(a) Use Newton's method starting with $x_0 = 2$. Take several steps. What do you notice?

$f(x) = x^3 - 16x + 32$

$f'(x) = 3x^2 - 16$

$$x_{n+1} = x_n - \frac{x_n^3 - 16x_n + 32}{3x_n^2 - 16}$$

$x_0 = 2$

$x_1 = 4$

$x_2 = 3$

$x_3 = 2$

$\vdots$

Cycles 2-4-3 Forever

(b) Use Newton's method with a better initial guess. Take enough steps to determine the solution with several digits of accuracy.

Based on the graph of f,

it looks like the solution

is close to $x = -5$.

$x_0 = -5$

See attachment. Solution is approx.

-4.76595

```
Python 2.7.13 |Anaconda custom (64-bit)| (default, Dec 19 2016, 13:29:36) [MSC
v.1500 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
========== RESTART: C:\Users\Steve Kifowit\Documents\python\newt.py
==========
0 -5.0
1 -4.77966101695
2 -4.76600278562
3 -4.76595153653
4 -4.76595153581
5 -4.76595153581
6 -4.76595153581
7 -4.76595153581
8 -4.76595153581
9 -4.76595153581
10 -4.76595153581
11 -4.76595153581
12 -4.76595153581
13 -4.76595153581
14 -4.76595153581
15 -4.76595153581
>>>
```