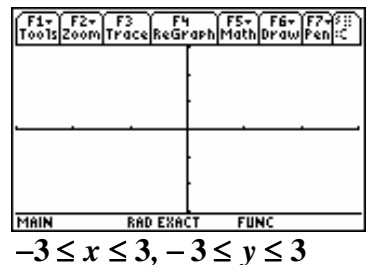


**Assignment 10: Newton's Method (3.1)**  
**Please provide a handwritten response.**

Name \_\_\_\_\_

**1a.** You can use Newton's method to find the approximate zeros of

$f(x) = x - \frac{7}{4}\sin x + \frac{1}{8}$ . First graph  $f(x) = x - \frac{7}{4}\sin x + \frac{1}{8}$  as **y1** (watch that you've used enough parentheses) and record your results below.



**1b.** How many zeros does  $f$  seem to have over  $-3 \leq x \leq 3$ ? Roughly where are they located?

**2a.** Suppose Newton's method is applied to  $f$  with  $x_0 = -1.3$ ; what would you expect the successive approximations  $x_1, x_2, \dots$  to do? Why?

**2b.** Apply  $x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)}$  to  $f(x) = x - \frac{7}{4}\sin x + \frac{1}{8}$  and fill in the chart. Enter

$f(x)$  as **y1** and  $f'(x)$  as **y2**. Now, on the home screen enter  $x0 - y1(x0) / y2(x0) / x0 = -1.3$ , press  $\blacklozenge$  **ENTER** and record your result as **x1**. You can use the right arrow to edit the last output,  $x1 - y1(x1) / y2(x1) / x1 =$ , by deleting **-1.3**. To place the **x1** value after **x1=** arrow up to the value in the history area and press **ENTER**. Pressing  $\blacklozenge$  **ENTER** again will give you the **x2** value. Repeat this process to fill in the table below. Would you say that Newton's method was successful in this case? What is the approximate value of the zero you are looking for?

$n$	$x_n$
<b>0</b>	-1.3
<b>1</b>	
<b>2</b>	
<b>3</b>	
<b>4</b>	
<b>5</b>	

**3a.** Now repeat the process with  $x_0 = -1.0$  and complete the table below. You can edit by following the procedure in **2b**. Did Newton's method succeed in this case?

$n$	$x_n$
<b>0</b>	-1.0
<b>1</b>	
<b>2</b>	
<b>3</b>	
<b>4</b>	
<b>5</b>	

**3b.** Since using  $x_0 = -1.0$  did not lead to the zero you were looking for, perhaps you need to increase  $x_0$  a bit more, say to  $-0.8$ . Now repeat the procedure to fill in the table below. Did Newton's method lead to a zero? Was it the one you were looking for?

$n$	$x_n$
<b>0</b>	-0.8
<b>1</b>	
<b>2</b>	
<b>3</b>	
<b>4</b>	
<b>5</b>	

**3c.** Try it one more time with  $x_0 = -0.6$  and complete the table below. Did you finally get the results you expected?

$n$	$x_n$
<b>0</b>	-0.6
<b>1</b>	
<b>2</b>	
<b>3</b>	
<b>4</b>	
<b>5</b>	

**3d.** What do you think is the most difficult aspect of using Newton's method?

**4.** In an assignment 3 you used the **solve** command to find the zeros of functions numerically. Use the **solve** command to solve  $f(x) = x - \frac{7}{4}\sin x + \frac{1}{8}$  and record your results below. (You may need to press **♦ENTER** to have the calculator evaluate the zeros.) Do you reach the same conclusion you did with  $x_0 = -1.3$  when you use the solve command?