Math 171 - Quiz 9

November 6, 2014

Name key

Score _____

Show all work to receive full credit. Supply explanations when necessary.

1. (10/3 points) Use the linearization of $h(x) = \sqrt[3]{x} + \sqrt[5]{x}$ at $x = 1$ to approximate $\sqrt[3]{1.1} + \sqrt[5]{1.1}$.

$h(1) = 2$

$h'(x) = \frac{1}{3}x^{-2/3} + \frac{1}{5}x^{-4/5}$

$h'(1) = \frac{1}{3} + \frac{1}{5} = \frac{8}{15}$

$L(x) = 2 + \frac{8}{15}(x-1)$

$h(1.1) \approx L(1.1) = 2 + \frac{8}{15}(0.1)$

$= 2.05\overline{3}$

2. (10/3 points) Use Newton's method to find the smallest positive solution of $1 - x = x \sin 2x$.

$f(x) = x \sin 2x - 1 + x$

$f'(x) = \sin 2x + 2x\cos 2x + 1$

From graph, $X_0 = 0.5$ looks good.

$X_{N+1} = X_N - f(X_N)/f'(X_N)$

$\Downarrow$

$X_0 = 0.5$

$X_1 = 0.533279619$

$X_2 = 0.533200556$

$X_3 = 0.533200555$

3. (10/3 points) Some values of $f(x)$ and $f'(x)$ near $x = 1$ are given in the table below. Find the linearization of f at $x = 1$. Then use the linearization to approximate $f(0.75)$.

x	0.50	0.75	1.00	1.25	1.50
$f(x)$	6.08	6.90	8.00	9.41	11.14
$f'(x)$	2.74	3.82	5.00	6.26	7.60

$L(x) = f(1) + f'(1)(x-1)$

$L(x) = 8 + 5(x-1)$

$L(0.75) = 8 + 5(-0.25) = 6.75$