Math 171 - Quiz 9

November 7, 2013

Name key

Score _____

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

1. (4 points) Use the linearization of $f(x) = x^3 + \sqrt{x}$ at $x = 1$ to approximate $(0.98)^3 + \sqrt{0.98}$.

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

$f'(1) = 3 + \frac{1}{2} = \frac{7}{2}$

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

$L(x) = 2 + \frac{7}{2}(x-1)$

$L(0.98) = 2 + \frac{7}{2}(-0.02) = 1.93$

$f(0.98) \approx 1.93$

2. (3 points) Use Newton's method to approximate the smallest positive solution of $5x \sin x = 3$.

$f(x) = 5x \sin x - 3$

$f'(x) = 5\sin x + 5x\cos x$

$x_0 = 1$

$x_{N+1} = x_N - \frac{f(x_N)}{f'(x_N)}$, $N = 0, 1, 2, \ldots$

$x_0 = 1$

$x_1 = 0.8258455837$

$x_2 = 0.8203636389$

$x_3 = 0.8203567199$

$x_4 = x_3$

3. (3 points) Use Newton's method, starting with $x_0 = 2$, to approximate a solution of $x^3 - 16x + 32 = 0$.

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

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

$x_0 = 2$

$x_{N+1} = x_N - \frac{f(x_N)}{f'(x_N)}$, $N = 0, 1, 2, \ldots$

$x_0 = 2$

$x_1 = 4$

$x_2 = 3$

$x_3 = 2$

$x_4 = 4$

$x_5 = 3$

$x_6 = 2$

$\vdots$

NEWTON'S METHOD IS NOT CONVERGING TO A SOLUTION.