Math1210 Weekly Assignment 9  (Approximation - Antiderivatives 3.7, 3.8)

Spring, 2016  

Uid number: __________________________ 
name: __________________________

Instructions: Please show all of your work as partial credit will be given where appropriate, and there may be no credit given for problems where there is no work shown. All answers should be completely simplified, unless otherwise stated. No calculators or electronics of any kind are allowed. (Total of 50+5 points possible.)

1. (20 points) Use both the Bisection Method and Newton’s Method to approximate the real root of the given equation on the given interval. For the Bisection Method, find an answer with an accuracy of 2 decimal places; then run Newton’s Method and compare the speed of convergence (i.e. see how many exact decimal digits you get with the same number of iterations). Help yourself with a calculator when needed.

(a) \( x^3 + 4x - 6 = 0 \) on the interval \([1, 2]\)
(b) \( x^2 - 57 = 0 \) on the interval \([6, 8]\)
2. (15 Points) Evaluate the following indefinite integrals using the basic rules for antidifferentiation

(a) \[ \int (x^4 - 2x^3 + 5x - 3) \, dx \]
(b) \[ \int (z + 2\sqrt{z})^2 \, dz \]
(c) \[ \int \left( \cos t + 5t^3 - \frac{1}{\sqrt{t}} + \frac{1}{2} \sin t \right) \, dt \]
3. (15 points) Evaluate the following indefinite integrals using a suitable $u$ substitution or the Generalized Power Rule

(a) $\int (4x^2 + 1)(4x^3 + 3x - 1)^4 \, dx$

(b) $\int \frac{12x}{\sqrt{3x^2 + 3}} \, dx$

(c) $\int \cos x (1 - \sin x)^3 \, dx$
4. (Bonus, 5 points) Consider the equation \( x = \sqrt{3 + x} \).

(a) Apply the fixed-point theorem starting with \( x_1 = 0 \) to find \( x_2, x_3, x_4 \) and \( x_5 \).

(b) Algebraically solve for \( x \) the equation \( x = \sqrt{3 + x} \).

(c) Evaluate \( \sqrt{3 + \sqrt{3 + \sqrt{3 + \cdots}}}. \) [Hint: Let this quantity be equal to \( x \) and figure out how this relates to the above equation].