MA 16020 LESSON 5: INTEGRATION BY SUBSTITUTION (WORKSHEET)

<u>Example 1:</u> It is estimated that t hours after 8:00 am, the population of a certain bacterial sample will be changing at a rate of:

$$N'(t) = \frac{3t}{\sqrt{t+4}}$$ **bacteria per hour.**

Find the increase in the bacteria population from 11:00 am to 1:00 pm.

<u>Example 2:</u> It is estimated that t – weeks into a semester, the average amount of sleep a college math student gets per day $S(t)$ at a rate of

$$-\frac{6t}{e^{t^2}}$$ **hours per day.**

When the semester begins, math students sleep on average of 8.1 hours per day. What is $S(t)$, 10 week(s) into the semester?

<u>Example 3:</u> A certain plant grows at the rate $H'(t) = \frac{1}{\sqrt[3]{8t+3}}$ inches per day, t days after it was planted. How many inches will the height of the plant change on the third day? Round answer to 3 decimal places.

Definition: For $f(x)$ defined on $[a, b]$, the average value of $f(x)$ on $[a, b]$ is:

$$f_{AVE}(x) = \frac{1}{b-a}\int_a^b f(x)\ dx$$

Example 4: Find the average value of $f(x) = 6x^2 + 2$ over $[1, 3]$.

Example 5: Find the average value of $f(x) = xe^{x^2}$ over $[0, 2]$.

<u>Example 6:</u> After t months on the job, a postal clerk can sort

$$Q(t) = 700 - 400e^{-0.5t}$$

Letters per hour. What is the average rate at which the clerk sorts mail during the first 3 months on the job? Round your answer to two decimal places.