Calculus II

Professor Johnson

Fall 2006

Name: _____

Name of group member: _____

Name of group member: _____

Problem 1: Let $f(x)$ be the continuous function graphed below and let $g(x) = \int_{-2}^{x} f(t)\ dt$.

(a) Evaluate $g(2)$.

(b) Evaluate $g'(-3)$.

(c) Over what intervals shown on the graph is $g(x)$ concave down? Explain your answer.

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Problem 2: Show all steps and use correct mathematical grammar for full credit.

(a) Prove that the integral formula below is true.

$$\int \cot^2(x)\ dx = -\cot(x) - x + C$$

(b) Evaluate the integral. (Evaluate all trig functions in your final answer.)

$$\int_{\pi/12}^{\pi/6} \cot^2(2x)\ dx.$$

Problem 3: Below is the definition of the integral using Riemann sums with right-hand endpoints.

$$\int_a^b f(x)\ dx = \lim_{n\to\infty} \sum_{i=1}^n f(x_i)\Delta x$$

(a) Explain the meaning of Δx in this definition.

(b) Explain the meaning of $\displaystyle\sum_{i=1}^n f(x_i)\Delta x$ in this definition.

(c) Explain why the definition of the integral contains a limit as n goes to infinity.

(d) Use the definition of the integral to calculate the integral below. You can use the Fundamental Theorem of Calculus to check your answer, but you will earn zero points for using only the Fundamental Theorem of Calculus on this problem.

$$\int_1^3 7 - x\ dx$$