Math 140
Exam #4
Summer '10

Name:

1. [10 pts.] Use the Midpoint Rule with $n = 4$ to approximate the integral $\int_2^{10} \sqrt{x^3 + 1}\ dx$. Round the answer to four decimal places.

2. [15 pts.] The definite integral can be defined as $\int_a^b f(x)\ dx = \lim_{n\to\infty} \sum_{i=1}^{n} f(x_i)\Delta x$, where $\Delta x = \dfrac{b-a}{n}$ and $x_i = a + i\Delta x$. Use this definition to evaluate $\int_0^2 (2 - x^2)\ dx$.

3. [10 pts. each] Use Part 1 of the Fundamental Theorem of Calculus to find the derivative of the function.

   (a) $h(r) = \int_9^r r^2 \sin r\ dr$.

   (b) $y = \int_0^{\tan x} \sqrt{t + \sqrt{t}}\ dt$.

4. [10 pts. each] Evaluate the integral.

   (a) $\int_4^{16} \dfrac{x - 1}{\sqrt{x}}\ dx$

   (b) $\int_0^{\pi/4} \dfrac{1 + \cos^2\theta}{\cos^2\theta}\ d\theta$

   (c) $\int_{-3}^{2} (x - 2|x|)\ dx$

   (d) $\int_0^1 x^2(1 + 2x^3)^5\ dx$

   (e) $\int_{-\pi/6}^{\pi/6} \tan^3\varphi\ d\varphi$

5. [10 pts. each] Find the indefinite integral.

   (a) $\int \cos\theta \sin^6\theta\ d\theta$

   (b) $\int (x + 1)\sqrt{2x + x^2}\ dx$

6. [15 pts.] Find the area of the region enclosed by the curves $y = \sqrt{x + 3}$ and $y = (x + 3)/2$.

7. [15 pts.] Find the volume of the solid obtained by rotating about the x-axis the region bounded by the curves $y = x^3$, $y = x$, and $x \geq 0$.