Assignment 5

(Follows Unit 13 in the manual)

Values

[8]   1. Find a positive number such that the sum of the number and its reciprocal is as small as possible.   [cf. Section 4.7]

[10] 2. A box with a square base and open top must have a volume of $32,000\,cm^3$. Find the dimension of the box that minimize the amount of material used. [cf. Section 4.7]

[8]   3. Find the points on the hyperbola $y^2 - x^2 = 4$ that are closest to the point (2, 0)

[6]   4. Find the most general antiderivative $F(x)$ of the given function $f(x)$. [cf. Section 4.10]

(a) $f(x) = 4x^3 + 3x - 7$

(b) $f(x) = \dfrac{1}{x} - 3\cos x$

[8]   5. Find the antiderivative $F(x)$ of the function $f(x)$ that satisfies the given conditions.   [cf. Section 4.10]

(a) $f(x) = 8x^3 + 2x + 1 \quad F(2) = 15$

(b) $f(x) = 4e^x - 2\sin x \quad F(0) = 7$

[10] 6. Find the area of the region that lies under the graph of $f(x) = x$ between $x = 0$ and $x = 2$ by taking the limit of the sum of approximating rectangles whose heights are the values of the function at the right hand end point of each subinterval. [cf. Section 5.1]
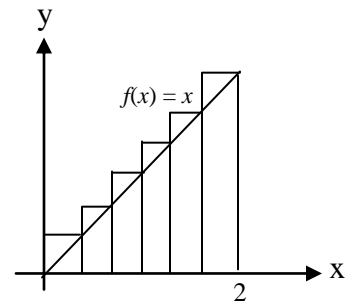
[10]   7. Evaluate each of the following definite integrals by interpreting it as an area.

(a) $\int_{1}^{5} (x+2)dx$ (b) $\int_{-3}^{3} \sqrt{9-x^2}\,dx$

[10]   8. Use the Fundamental Theorem of Calculus to evaluate the following definite integrals.   [cf. Section 5.3]

(a) $\int_{1}^{4} \left(2x^3 - x^2 + 3x\right)dx$ (b) $\int_{1}^{4} \left(\frac{x^3-3}{x}\right)dx$

Total = 70