Math 215
Spring 08
Freese

Practice Problems 2

(1) A cylindrical can without a top is made to contain $20cm^3$ of liquid. The metal for the circular base costs $\$2/cm^2$ and the metal for the sides costs $\$1/cm^2$.Find the dimensions that will minimize the cost of the metal to make the can, and also the value of the minimum cost.

(2) Show that of all the rectangles with a given area A, the one with the smallest perimeter is a square.

(3) A plane is flying horizontally at an altitude of 1mi. and a ground speed of 500mi/hr passes directly over a radar station. Find the rate at which the distance to the radar station is increasing when it is 2mi. away from the station.

(4) Find y' using implicit differentiation:
$y^3 + y^2 - x^3 = 5$

(5) Find the following indefinite integrals:
(i)
$$\int \sqrt{1+x^2}x^5 dx$$
(ii)
$$\int \frac{e^x}{e^x+1} dx$$
(iii)
$$\int \frac{e^{\sqrt{x}+1}}{\sqrt{x}} dx$$

(6) Evaluate the definite integrals:
(i)
$$\int_1^2 x\sqrt{x-1}\, dx$$
(ii)
$$\int_0^4 \frac{x}{\sqrt{1+2x}} + x\, dx$$
(iii)
$$\int_0^2 \frac{dx}{(2x-3)^2}\, dx$$

(7) For the following functions find:
(a) the intervals of increase and decrease
(b) the relative(local) extrema
(c) the intervals of concavity
(d) inflection points
(i) $f(x) = 1 - 3x + 5x^2 - x^3$
(ii) $f(x) = x^4 - 6x^2$
(iii) $f(x) = \ln(1 + x^2)$

(8) Find the absolute maximum and absolute minimum of the following functions on the given intervals:
(i)$f(x) = \sqrt{9-x^2}$ on $[-1, 2]$
(ii)$f(x) = x^2 + \frac{2}{x}$ on $[\frac{1}{2}, 2]$