

Math 1591 - Sample Test 3

1. A rancher has 240 feet of fencing with which to enclose two adjacent rectangular corrals. What dimensions should be used so that the enclosed area will be a maximum?
2. An box with a square bottom is to be built that holds 64 cubic feet. Find the dimensions of the box that will minimize the surface area of the box.
3. Find the area bound by the following curves

(i) $y = x^2 + 1, y = 0, x=1, x=2$ (ii) $y = x^2, y = 1.$

(iii) $x = y^2, y = \frac{x}{2} - \frac{3}{2}$ (iv) $y = \begin{cases} x, & x < 1 \\ 2-x, & x \geq 1 \end{cases}, y = 0.$

4. Evaluate the following

(i) $\frac{d}{dx} \int_x^1 \sin t^2 dt$ (ii) $\frac{d}{dx} \int_x^{x^2} \frac{dt}{\sqrt{1+t^2}}$

5. Evaluate the following definite and indefinite integrals

(i) $\int \frac{x-1}{\sqrt{x}} dx$ (ii) $\int_0^{1/2} \frac{dx}{4x^2 + 1}$ (iii) $\int x\sqrt{x-1} dx$ (iv) $\int_0^{\pi/4} \sec^2 x dx$
 (v) $\int_0^4 \frac{x dx}{\sqrt{9+x^2}}$ (vi) $\int_{\pi/12}^{\pi/6} \sin 2x \cos 2x dx$ (vii) $\int \frac{1}{4x^2 + 4x + 2} dx$
 (viii) $\int x(1 + \sec^2 x^2) dx$ (ix) $\int \frac{x^2 + 1}{x + 1} dx$ (x) $\int_e^{e^2} \frac{dx}{x \ln x}$ (xi) $\int \frac{dx}{1 + \sqrt{x}}$
 (xii) $\int \frac{e^{2x} dx}{1 + e^x}$ (xiii) $\int_0^1 x e^{-x^2} dx$ (xiv) $\int_{-1}^0 \frac{1}{x^2 + 2x + 2} dx$

6. Using n rectangles and the limit process find the area of the region between the graph of the function:

(i) $y = 2x - x^2$ and the x -axis on the interval $[1,2]$
 (ii) $y = x^2 + 1$ and the x -axis on the interval $[1,4]$.