Mathematics 53 (Exercises)

(Antidifferentiation, Particular Antiderivatives, Area of a Plane Region, The Definite Integral, The Mean Value Theorem for Integrals, The Fundamental Theorems of Calculus, Area and Arc Length, Volume of Solids by Slicing and Disk-Washer Method)

I.   Evaluate the following antiderivates.

1. $\int (x^3+3)^{1/4} x^5 \, dx$

2. $\int \sin\theta \sin(\cos\theta) \, d\theta$

II.   The points (-1,3) and (0,2) are on a curve and at any point (x,y) on the curve $\frac{d^2y}{dx^2} = 2 - 4x$. Find the equation of the curve.

III. A stone is thrown vertically upward from the ground with an initial velocity of 128 ft/sec.

(i)   Find how high the stone will go.

(ii)   How long will it take for the stone to strike the ground?

(iii)   What is its speed at which it strikes the ground?

IV.   Find the area of the region bounded by the curve $y = x^2$, the x-axis, and the line $x = 3$. (Use inscribed/circumscribed rectangles.)

V.   Find the derivative of the following:

1. $\int_0^{x^2} \frac{dt}{\sqrt{t^2+1}}$

2. $\int_{-x}^{x} \cos(s^2+1) \, ds$

VI.   Evaluate the following definite integral.

1. $\int_2^4 \frac{w^4-w}{w^3} \, dw$

2. $\int_{\pi/8}^{\pi/4} 3\csc^2 2\theta \, d\theta$

3. $\int_2^4 |3x^2-10x+3| \, dx$

VII. Evaluate:

$$\int_4^{16} \left[D_x \int_5^x (2\sqrt{t} - 1) \, dt \right] dx.$$

VIII. Set up the definite integral to find the area of the region bounded by $f(x)=x^2 - 2x+1$ and $g(x)=7 - x$.
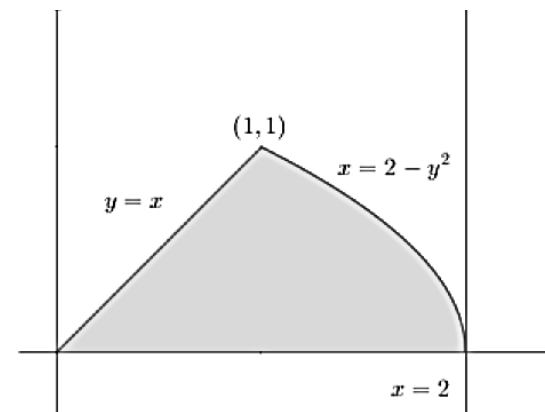
IX.   Given that $\int_0^\pi \sin x \, dx = 2$, find the average value of the sine function on the given interval.

X.   Prove: $\int_{-3}^{3} \frac{1}{x^2 +6} \, dx \le 1$.

XI.   Find the length of the arc of the curve $8y = x^4 + 2x^2$ from the point where $x = 1$ to the point where $x = 2$.

XII. Derive the formula for the volume of the solid sphere of radius r units. (Use volume by slicing.)

XIII.

(i) What is the volume of the solid of revolution generated when the plane region above is revolved around the line $x = 2$? about the x-axis?

-END OF EXERCISES-

"Pano kung yung volume ng solid naging volume ng liquid? Pano yun?"

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