Using the calculator to compute area

$A)\ \int_0^8 \frac{1}{5+3\cos(x)}$

$B)$ Find the Area of the region between the x - axis and the graph of $y=\sqrt{9-4x^2}$.

C) For what value of x does $\int_0^x t^2\,dt = 2$

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$\frac{1}{3}t^3\Big]_0^x = 2$

$(3)\ \frac{1}{3}x^3 = 2(3)$

$x^3 = 6$

$x = \sqrt[3]{6}$

$\cancel{\int e^{-t^3} = e^{-t^3}}$

$\cancel{\frac{d}{dx}\left(e^{-t^3}\right) = e^{-t^3} \cdot -3t^2}$

D) For what value of x does $\int_0^x e^{-t^3}\,dt = .5695$

E) Find the area of the region in the first quadrant enclosed by the coordinate axes and the graph of $x^5 + y^5 = 1$.

F) Find the average value of $\sqrt{\sin x}$ on the interval [1, 2].

What you'll Learn About

- Analyzing antiderivatives graphically
- Connecting Antiderivatives to Area
- Taking the derivative of an integral

Long Way

(Proof)

A) Find $\frac{d}{dx}\left[\int_1^x (\cos t)dt\right]$

$\frac{d}{dx}\left[\sin t\right]_1^x$

$\frac{d}{dx}\left[\sin x - \sin 1\right]$

$\boxed{\frac{d}{dx}\int_1^x \cos t\,dt = \cos x}$

B) Find $\frac{d}{dx}\left[\int_1^{x^3} (\cos t)dt\right]$

$\frac{d}{dx}\left[\sin t\right]_1^{x^3}$

$\frac{d}{dx}\left[\sin(x^3) - \sin 1\right]$

$\boxed{\frac{d}{dx}\int_1^{x^3} \cos t\,dt = \cos(x^3)\cdot 3x^2}$

C) Find $\frac{d}{dx}\left[\int_{x^3}^{x^2} (\cos t)dt\right]$

$\frac{d}{dx}\left[\sin t\right]_{x^3}^{x^2}$

$\frac{d}{dx}\left[\sin(x^2) - \sin(x^3)\right]$

$\boxed{\frac{d}{dx}\int_{x^3}^{x^2} \cos t\,dt = \cos(x^2)\cdot 2x - \cos(x^3)\cdot 3x^2}$

Find $\frac{dy}{dx}$ for the given function

2) $y = \int_2^x \left(3t + \cos(t^2)\right)dt$

$$\frac{dy}{dx} = \left(3x + \cos(x^2)\right)\cdot 1 - \left(3\cdot 2 + \cos(2^2)\right)\cdot 0$$

$$\frac{dy}{dx} = \left(3x + \cos(x^2)\right)$$

10) $y = \int_6^{x^2} \left(\cot(3t)\right)dt$

$$\frac{dy}{dx} = \cot(3x^2)\cdot 2x$$

12) $y = \int_\pi^{\pi - x} \left(\frac{1+\sin^2 t}{1+\cos^2 t}\right)dt$

$$\frac{dy}{dx} = \left(\frac{1+\sin^2(\pi - x)}{1+\cos^2(\pi - x)}\right)\cdot(-1)$$

14) $y = \int_x^7 \left(\sqrt{2t^4 + t + 1}\right)dt$

$$\frac{dy}{dx} = 0 - \sqrt{2x^4 + x + 1}$$

20) $y = \int_{\sin x}^{\cos x} \left(t^2\right)dt$

$$\frac{dy}{dx} = (\cos x)^2\cdot(-\sin x) - (\sin x)^2\cdot \cos x$$