
Complete the following problems. Show all work to receive full credit.

1. Calculate $\int_0^{\pi} \sin x \, dx$

$$\begin{aligned} &= -\cos x \Big|_0^{\pi} \\ &= -\cos \pi + \cos 0 \\ &= -(-1) + 1 \\ &= 1 + 1 = 2 \end{aligned}$$

2. Calculate $\frac{d}{dx} \int_0^{\tan x} \sec^2 t \, dt$

$$= \sec^2(\tan x) \cdot \sec^2 x$$

3. Find the total area between $y = -x^2 - 3$ and the x -axis between $x = -4$ and $x = 6$.

We want total area, so we will make negative area positive once we are done with this calculation. Since the function lies entirely below the x -axis, this area will all be negative.

$$\begin{aligned} \int_{-4}^6 -x^2 - 3 \, dx &= -\frac{1}{3}x^3 - 3x \Big|_{-4}^6 \\ &= -\frac{1}{3}6^3 - 3(6) + \frac{1}{3}(-4)^3 + 3(-4) \\ &= -\frac{216}{3} - 18 - \frac{64}{3} - 12 \\ &= -\frac{370}{3} \end{aligned}$$

So the total area between the curve and the x -axis is $\frac{370}{3}$.