**Answer on Question #46051 – Math - Integral Calculus**

Find the surface area of the band of the sphere generated by revolving the arc of the cicle

x^2+y^2=r^2

lying above the interval [-a,a],a,r

π

3π

4πar

2πar

**Solution.**

**In the case when $f(x)$ is positive and has a continuous derivative, the surface area of the surface generated by revolving the curve $y = f(x),\ a \le x \le b$ about the $x$ − axis is:**

$$S = 2\pi \int_{x_1}^{x_2} y\sqrt{1 + \left(\frac{dy}{dx}\right)^2}\ dx\,.$$

**In our case:** $y = \sqrt{r^2 - x^2}\,,\ x_1 = -a,\ x_2 = a,$

$$\frac{dy}{dx} = \frac{1}{2}(r^2 - x^2)^{-\frac{1}{2}}(-2x) = -\frac{x}{\sqrt{r^2 - x^2}}\,.$$

**So,** $S = 2\pi \int_{-a}^{a} \sqrt{r^2 - x^2}\sqrt{1 + \frac{x^2}{r^2 - x^2}}\ dx = 2\pi \int_{-a}^{a} \sqrt{r^2 - x^2}\frac{r}{\sqrt{r^2 - x^2}} dx =$

$$= 2\pi r \int_{-a}^{a} dx = 2\pi r x\Big|_{x=-a}^{x=a} = 2\pi a r + 2\pi a r = 4\pi a r\,.$$

**Right answer is #3.**