

Paint Pot if you know about integration ...

Take the curve  $y = \frac{1}{x}$  between  $x=1$  and  $x=\infty$  and rotate it  $360^\circ$  around the x axis to form a long, funnel shaped paint pot. DIAGRAM???

The volume of the paint pot is:

$$\int_1^{\infty} \pi y^2 dx = \int_1^{\infty} \frac{1}{x^2} dx = \dots = \pi$$

The surface area of the paint pot is:

$$\int_1^{\infty} 2\pi y \sqrt{1 + \left(\frac{dy}{dx}\right)^2} dx = \int_1^{\infty} 2\pi \frac{1}{x} \sqrt{1 + \left(\frac{1}{x^4}\right)} dx$$

Now this integral is too difficult for me but ...

$$2\pi \frac{1}{x} \sqrt{1 + \left(\frac{1}{x^4}\right)} > 2\pi \frac{1}{x}$$

So the surface area of the paint pot is greater than:

$$\int_1^{\infty} 2\pi \frac{1}{x} dx = \dots = \infty$$

So the paint pot has a finite volume but an infinite surface area.

If you fill the pot with paint then you won't have enough paint to cover the surface of the pot!