$$S = \int_1^2 \frac{2}{x^2}\,dx$$

$$= \left[-\frac{2}{x}\right]_1^2 = -(1-2) = 1$$

$$S = \int_0^1 \frac{4}{1+x^2}\,dx$$

$x = \tan\theta \left(-\frac{\pi}{2} < 0 < \frac{\pi}{2}\right)$ と置く。

$$\frac{dx}{d\theta} = \frac{1}{\cos^2\theta}$$ より

$$\int_0^{\frac{\pi}{4}} \frac{4}{\tan^2\theta + 1} \frac{1}{\cos^2\theta}\,d\theta$$

$$= \int_0^{\frac{\pi}{4}} \frac{4}{\frac{1}{\cos^2\theta}} \cdot \frac{1}{\cos^2\theta}\,d\theta$$

$$= \int_0^{\frac{\pi}{4}} 4\,d\theta = \left[4\theta\right]_0^{\frac{\pi}{4}} = \pi$$