

Calcular  $I = \int_0^\pi \sin^2 \left( 1 + \frac{\theta}{2} \right) d\theta$ .

$$I = \int_0^\pi \cos^2 \left( \frac{\pi}{2} - 1 - \frac{\theta}{2} \right) d\theta = \int_0^\pi \frac{\cos(\pi - 2 - \theta) + 1}{2} d\theta$$


Seja  $u = \pi - 2 - \theta$ ,  $du = -d\theta$ .

$$I = \int_{-2}^{\pi-2} \frac{1 + \cos u}{2} du = \frac{u}{2} \Big|_{-2}^{\pi-2} + \frac{\sin(u)}{2} \Big|_{-2}^{\pi-2} = \frac{\pi-2}{2} + 1 + \frac{\sin(\pi-2)}{2} + \frac{\sin 2}{2} = \boxed{\frac{\pi}{2} + \sin 2}$$

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Sugestões, comunicar erros: "a.vandre.g@gmail.com".

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