Conditions

prove that integral of sin^2wdw/w^2 having limits 0 to infinite =pi/2 ??

Solution

Consider the integral:

$$\int_0^{\infty} \frac{\sin^2 w\, dw}{w^2}$$

As we know, this integral cannot be represented by using elementary functions, that's why in math appeared the definition of Sine integral:

$$\mathrm{Si}(x) = \int_0^x \frac{\sin t}{t}\, dt$$

One of the properties of this integral is:

$$\lim_{x \to +\infty} \mathrm{Si}\ x = \frac{\pi}{2},$$

It's known, that

$$\int \frac{\sin^2 w\, dw}{w^2} = Si(2w) - \frac{\sin^2 w}{w} + c$$

$$\int_0^{\infty} \frac{\sin^2 w\, dw}{w^2} = \lim_{x \to \infty} \int_0^{x} \frac{\sin^2 w\, dw}{w^2} = \lim_{x \to \infty} Si(2x) - 0 - 0 + 0 = \frac{\pi}{2}$$