

NEW FORMULA 3.853.2

The original formula is

$$\int_0^{\infty} \frac{\cos(ax^2)}{\beta^2 + x^2} dx = \frac{\pi}{2\beta} \left[\cos(a\beta^2) - \sqrt{2} \cos\left(a\beta^2 + \frac{\pi}{4}\right) C(\sqrt{a}\beta) - \sqrt{2} \sin\left(a\beta^2 + \frac{\pi}{4}\right) S(\sqrt{a}\beta) \right]$$

The change of variables $x = t/\sqrt{a}$ and writing $b = \sqrt{a}\beta$ gives the new formula (going back to x as the integration variable)

$$\int_0^{\infty} \frac{\cos(x^2)}{b^2 + x^2} dx = -\frac{\pi}{2b} \left[\sqrt{2} \cos(b^2 + \pi/4) C(b) + \sqrt{2} \sin(b^2 + \pi/4) S(b) - \cos(b^2) \right]$$