! For an efficient use of these tables, first read `HowTo.pdf`.

T3.02B. Powers of x, binomials of the form $(a + b\,x)$ and polynomials in x on the interval $(-\infty, \infty)$.

1. $$\int_{-\infty}^{\infty} \frac{x^{2m}\,dx}{x^{4n} + 2x^{2n}\cos t + 1} = \frac{\pi}{n}\sin\left[\frac{(2n-2m-1)t}{2n}\right]\csc t \csc\frac{(2m+1)\pi}{2n}, \quad m < n,\ t^2 < \pi^2.$$

2. $$\int_{-\infty}^{\infty} \frac{x^{2m} - x^{2n}}{1 - x^{2k}}\,dx = \frac{\pi}{k}\left[\cot\left(\frac{2m+1}{2k}\pi\right) - \cot\left(\frac{2n+1}{2k}\pi\right)\right], \quad m < k,\ n < k.$$

3. $$\int_{-\infty}^{\infty} \frac{dx}{(1+x^2)\sqrt{4+3x^2}} = \frac{\pi}{3}.$$

4. $$\int_{-\infty}^{\infty} \frac{dx}{(1+x^2)\,\sqrt{b+ax^2}} = \begin{cases} \dfrac{2}{\sqrt{b-a}} & \text{if } b > a, \\ \dfrac{2}{\sqrt{a}} & \text{if } a = b, \\ \dfrac{1}{\sqrt{a-b}}\ln\left(\dfrac{\sqrt{a}+\sqrt{a-b}}{\sqrt{a}-\sqrt{a-b}}\right) & \text{if } b < a. \end{cases}$$

5. $$\int_{-\infty}^{\infty} \left(1 + \frac{x^2}{n-1}\right)^{-n/2} dx = \frac{\sqrt{\pi(n-1)}}{\Gamma(n/2)}\,\Gamma\left(\frac{n-1}{2}\right), \quad n > 1.$$

6. $$\int_{1}^{\infty} x^{\mu-1}(x^p - 1)^{\nu-1}\,dx = \frac{1}{p}\,\mathrm{B}\left(1 - \nu - \frac{\mu}{p}, \nu\right), \quad p > 0,\ \Re\{\nu\} > 0,\ \Re\{\mu\} < p - p\,\Re\{\nu\}.$$

7. $$\int_{-\infty}^{\infty} \frac{dx}{(ax^2 + 2bx + c)^n} = \frac{(2n-3)!!\,\pi a^{n-1}}{(2n-2)!!\,(ac-b^2)^{n-1/2}}, \quad a > 0,\ ac > b^2.$$

8. $$\int_{-\infty}^{\infty} \frac{x\,dx}{(ax^2 + 2bx + c)^n} = -\frac{(2n-3)!!\,\pi b\,a^{n-2}}{(2n-2)!!\,(ac-b^2)^{(2n-1)/2}}, \quad ac > b^2,\ a > 0,\ n \geq 2.$$

9. $$\int_{-\infty}^{\infty} \frac{x^m\,dx}{(ax^2+2bx+c)^n} = \frac{(-1)^m \pi a^{n-m-1} b^m}{(2n-2)!!(ac-b^2)^{n-1/2}}$$
$$\times \sum_{k=0}^{[m/2]} \binom{m}{2k} (2k-1)!!(2n-2k-3)!! \left(\frac{ac-b^2}{b^2}\right)^k, \quad ac > b^2,\ 0 \le m \le 2n-2.$$