

$$(6.2.20) \quad I = \int \frac{dx}{x^3 + 2x^2 + 2x}.$$

$$\begin{aligned} \frac{1}{x(x^2 + 2x + 2)} &= \frac{A}{x} + \frac{Bx + C}{x^2 + 2x + 2} \\ &= \frac{A(x^2 + 2x + 2) + (Bx + C)x}{x(x^2 + 2x + 2)} \end{aligned}$$

$$\left. \begin{array}{l} x^2: A + B = 0 \\ x^1: 2A + C = 0 \\ x^0: 2A = 1 \end{array} \right\} \begin{array}{l} A = 1/2 \\ B = -1/2 \\ C = -1 \end{array}$$

$$I = \frac{1}{2} \int \frac{dx}{x} + \int \frac{-\frac{1}{2}x - 1}{x^2 + 2x + 2} dx$$

$$= \frac{1}{2} \ln|x| - \frac{1}{2} \int \frac{x+1}{(x+1)^2 + 1} dx - \frac{1}{2} \int \frac{dx}{(x+1)^2 + 1}$$

$$= \frac{1}{2} \ln|x| - \frac{1}{4} \ln|(x+1)^2 + 1| - \frac{1}{2} \arctan(x+1) + C.$$