1. Evaluate with substitution

$$\int x\sqrt{x+3}\,dx$$

Let $u = x+3$ $\dfrac{du}{dx} = 1$ $du = dx$

$x = u - 3$

$$\int u - 3 \cdot \sqrt{u}\,du$$

$$= \int (u-3)\, u^{\frac{1}{2}}\,du$$

$$= \int \left(u^{\frac{3}{2}} - 3u^{\frac{1}{2}}\right)du$$

$$= \frac{u^{\frac{3}{2}+1}}{\frac{3}{2}+1} - 3 \cdot \frac{u^{\frac{1}{2}+1}}{\frac{1}{2}+1}$$

$$= \frac{2}{5} u^{\frac{5}{2}} - 2u^{\frac{3}{2}} + c$$

2 Compute:

$$\int \frac{x^2}{(x^3+1)^2}\,dx$$

Let $u = (x^3+1)$ $\dfrac{du}{dx} = 3$ $du = 3x^2\,dx$

$dx = \frac{1}{3}x^2\,du$

$$= \frac{x^2}{(u)^2} \cdot \frac{1}{3}x^2\,du$$

$$\int \frac{1}{(u)^2} \cdot \frac{1}{3}\,du$$

$$\frac{1}{3}\int u^{-2}\,du$$

$\cup (u)^2 \quad 3$

$\frac{1}{3} \int u^{-2} du$

$= \frac{1}{3} \cdot \frac{u^{-1}}{-1}$

$= \frac{1}{3} \cdot \frac{-1}{u} = -\frac{1}{3u} + c$

$= \dfrac{-1}{3(x^3 + 1)} + c$

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