

①

More Substitution:

Consider $\int x \sqrt{x+3} dx$.

$$\text{Let } u = x+3 \rightarrow x = u-3 \\ du = dx$$

$$\int x \sqrt{x+3} dx = \int (u-3) \sqrt{u} du$$

$$= \int u \sqrt{u} du - 3 \int \sqrt{u} du$$

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

$$= \frac{2}{5} u^{5/2} - 3 \cdot \frac{2}{3} u^{3/2} + C$$

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

$$= \frac{2}{5} (x+3)^{5/2} - 2(x+3)^{3/2} + C.$$