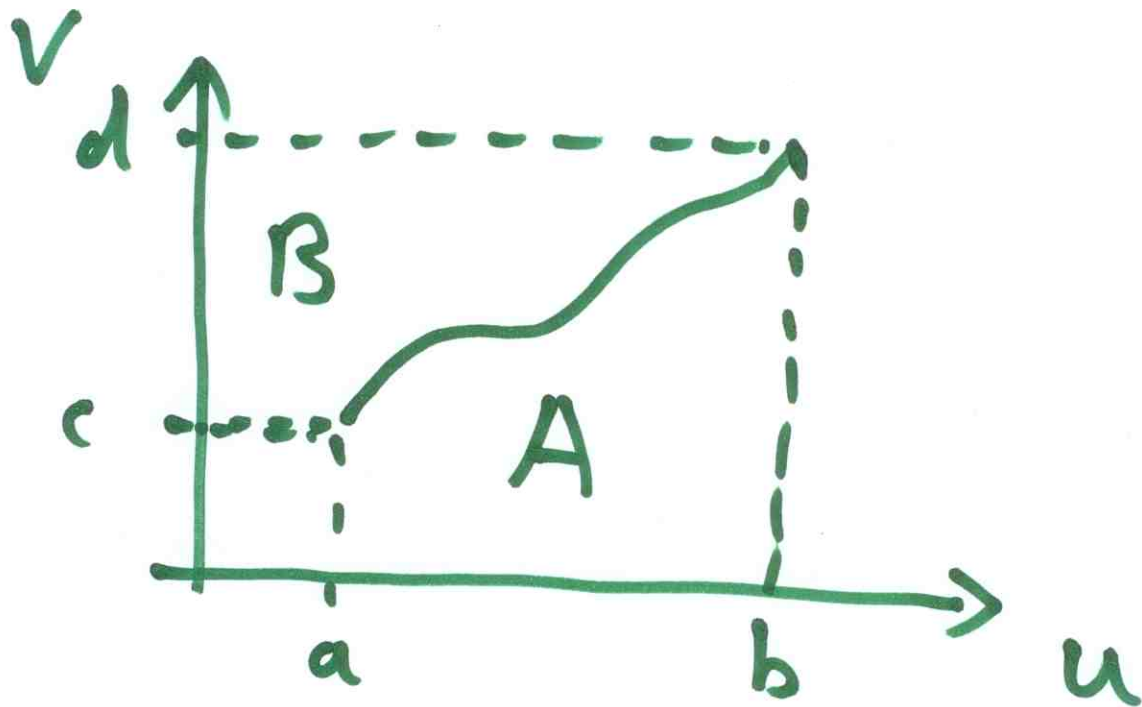# Integration by Parts

$$V = f(u) \quad , \quad v \geq 0$$
$$u = f^{-1}(v) \quad , \quad u \geq 0$$

$$\text{Area of } A = \int_a^b v \, du$$
$$\text{Area of } B = \int_c^d u \, dv$$

$$\text{Area of } A + \text{Area of } B$$

$$= bd - ac$$

$$= \left[uv \right]_{u=a \, , \, v=c}^{u=b \, , \, v=d}$$

$$\therefore$$

$$\int_{c}^{d} u \, dv = \left[uv \right]_{a}^{b} - \int_{a}^{b} v \, du$$