5 Интегрирование по частям

$$\frac{d}{dx}(uv) = \frac{du}{dx}v + u\frac{dv}{dx} \Rightarrow$$

$$\Rightarrow \frac{d}{dx}(uv)dx = \left(\frac{du}{dx}v + u\frac{dv}{dx}\right)dx = v\frac{du}{dx}dx + u\frac{dv}{dx}dx \Leftrightarrow$$

$$\Leftrightarrow d(uv) = v\,du + u\,dv \Rightarrow$$

$$\Rightarrow \int d(uv) = \int (v\,du + u\,dv) = \int v\,du + \int u\,dv \Rightarrow$$

$$\Rightarrow uv = \int v\,du + \int u\,dv \Leftrightarrow \int u\,dv = uv - \int v\,du$$

$$\frac{d}{dx}(uv) = \frac{du}{dx}v + u\frac{dv}{dx} \Rightarrow \boxed{\int u\,dv = uv - \int v\,du}$$