Calculus II
Reference: strategy for integrating by parts

Todor Milev

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Integration by Parts

Every differentiation rule corresponds to a differential form rule which in turn corresponds to an integration rule.

$$
\begin{array}{rcl|l}
(uv)' & = & u'v + uv' & \text{Product Rule} \\
\mathrm{d}(uv) & = & v\mathrm{d}u + u\mathrm{d}v & \text{Differential Prod. Rule} \\
\int \mathrm{d}(uv) & = & \int v\mathrm{d}u + \int u\mathrm{d}v & \text{integration of the above} \\
uv & = & \int v\mathrm{d}u + \int u\mathrm{d}v & \text{rearrange} \\
\int u\mathrm{d}v & = & uv - \int v\mathrm{d}u &
\end{array}
$$

We just proved the following.

Proposition ((Rule of) Integration by Parts)

$$\int u\mathrm{d}v = uv - \int v\mathrm{d}u$$

Integration by parts: strategy for applying

Integration by parts:

$$\int u\mathrm{d}v = uv - \int v\mathrm{d}u.$$

Generally: Choose u in this order: **LIPET**

Logs, Inverse trig, Polynomial, Exponential, Trig