Claim 1. $\int uv' = uv - \int vu'$

Proof. According to the Power Rule of differentiation:

$\frac{d}{dx}uv = uv' + vu'$

$\implies d(uv) = uv'dx + vu'dx$

Integrating both sides:

$\int d(uv) = \int uv'dx + \int vu'dx$

$\implies uv = \int uv'dx + \int vu'dx$

Rearranging the expressions:

$\int uv' = uv - \int vu'$

This identity is also known as Integration By Parts. □