6.1 Integration by Parts

RECALL: $u$-substitution from Calculus I

$$\int g(f(x))f'(x)dx$$

$$u =$$

$$du =$$

EXAMPLES

1. $\int e^{3x}dx$

2. $\int \sqrt{x-5} dx$

NOW: Consider $w = uv$, where $u$ and $v$ are both functions of $x$. Then

Thus

$$\int u \, dv = uv - \int v \, du$$

INTEGRATION BY PARTS

First step is to decide which is $u$ and which is $dv$. Usually, let $dv$ be the most complicated part that can be easily integrated.

EXAMPLES

1. $\int x\sqrt{x+3} \, dx$
2. \[ \int \ln x \, dx \]

3. \[ \int x^2 e^{3x} \, dx \]

4. \[ \int \sin^{-1} x \, dx \]

5. \[ \int t \cos 2t \, dt \]
6. \[\int _1^9 \ln \sqrt{x} \, dx\]

7. \[\int \sec^3 x \, dx\]
8. \[ \int e^x \sin 4x \, dx \]

9. \[ \int_0^2 x \ln(x + 1) \, dx \]