

MATH 132
Integration by Parts - Examples
February 2008

1.

$$\int x \ln 3x \, dx$$

Use integration by parts. Let $u = \ln(3x)$ and $dv = x \, dx$

2.

$$\int e^{2x} \sin(e^x) \, dx$$

Since $e^{2x} = (e^x)^2$ we can rewrite this as

$$\int e^x \sin(e^x) e^x \, dx.$$

Use substitution first. Let $w = e^x$ and so $dw = e^x \, dx$ and we get

$$\int w \sin w \, dw.$$

Now use integration by parts.

3.

$$\int x^3 \cos(x^2) \, dx$$

Since $x^3 = (x)(x^2)$ we can rewrite this as

$$\int x^2 \cos(x^2) x \, dx.$$

Use substitution first. Let $w = x^2$ and so $dw = 2x \, dx$ and we get

$$\int w \cos w \frac{1}{2} \, dw = \frac{1}{2} \int w \cos w \, dw.$$

Now use integration by parts.

4.

$$\int e^{2x} \cos x \, dx$$

Use integration by parts twice and algebra to solve for the original integral.

5.

$$\int x^2 (\ln x)^2 \, dx$$

Use integration by parts twice. Start with $u = (\ln x)^2$ and $dv = x^2 \, dx$.

6.

$$\int \cos \sqrt{x} \, dx$$

Use substitution first. Let $w = \sqrt{x}$ and so $dw = \frac{1}{2\sqrt{x}} \, dx$. Now $dx = 2\sqrt{x} \, dw = 2w \, dw$ and the integral becomes

$$\int \cos w (2w) \, dw = 2 \int w \cos w \, dw.$$

Now use integration by parts.