Math 1220 #9
Integration by Parts

$$\int udv = uv - \int vdu$$

Use the product rule for differentiation

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

Integrate both sides, simplify, rearrange

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

Integration by Parts

Look at the Product Rule for Differentiation.

$$D_x[u(x)v(x)] = u'(x)v(x) + v'(x)u(x)$$

EX 1

$$\int xsin\,(2x)dx$$

EX 2

$$\int \arctan(5x)\,dx$$

EX 3

$$\int \frac{\ln x}{\sqrt{x}}\,dx$$

Repeated Integration by Parts

EX 4

$$\int x^3 e^x dx$$

EX 5

$$\int e^x \cos x dx$$