# Contents

## 0.1 Integration by parts

### 0.1.1 Integration by parts

We have:

$\frac{\delta y}{\delta x} = f(x)g(x)$

We want that in terms of $y$.

We know from the product rule of differentiation:

$y = a(x)b(x)$

Means that:

$\frac{\delta y}{\delta x} = a'(x)b(x) + a(x)b'(x)$

So let's relabel $f(x)$ as $h'(x)$

$\delta$

$\frac{\delta y}{\delta x} = h'(x)g(x)$

$\frac{\delta y}{\delta x} + h(x)g'(x) = h'(x)g(x) + h(x)g'(x)$

$y + \int h(x)g'(x) = \int h'(x)g(x) + h(x)g'(x)$

$y + \int h(x)g'(x) = h(x)g(x)$

$y = h(x)g(x) - \int h(x)g'(x)$

For example:

$\frac{\delta y}{\delta x} = x.\cos(x)$

$f(x) = cos(x)$

$g(x) = x$

$h(x) = sin(x)$

$g'(x) = 1$

So:

$y = x \int cos(x)dx - \int sin(x)dx$

$y = xsin(x) - cos(x) + c$