Section 7.1: Integration by parts

Integration by parts:

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

Proof: Recall by the product rule that $(uv)' = u'v + uv'$. Integrate both sides:

$\int (uv)' = \int u'v + \int uv'$. Thus $uv = \int u'v + \int uv'$, hence $\int uv' = uv - \int u'v$

When using integration by parts, you mush choose u and dv so that when you apply the formula, $\int v\,du$ is integratable.

The following acronym may help you determine what u should be. Move down the chart and choose u to be the *first* term you see that starts with the letter on the left.

If	**Then** $u =$
L	[Logarithm]: $\ln x$
I	[Inverse trig]: $\arctan x$, $\arccos x$, $\arcsin x$
P	[Polynomial]: (x^2, $x^3 + x$, etc)
E	[Exponential]: e^x
T	[Trig]: $\sin x$ or $\cos x$

1. $\int xe^{-2x}\,dx$

2. $\int_0^1 (2x+1)e^x \, dx$

3. $\int x^5 e^{x^3} \, dx$

4. $\int x \sin(-5x)\, dx$

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

6. $\int \frac{\ln x}{x^7}\, dx$

7. $\int_1^4 \ln \sqrt{x}\, dx$

8. $\int \arcsin x\, dx$

9. $\int_0^1 \arctan x\, dx$

10. $\int e^x \cos(4x)\,dx$

11. $\int e^{5x} \sin(x)\,dx$