Integration by Parts:

Knowing which function to call *u* and which to call *dv* takes some practice. Here is a general guide:

u	**I**nverse Trig Function	($\sin^{-1} x, \arccos x,$ **etc**)
↕	**L**ogarithmic Functions	($\log 3x, \ln(x+1),$ **etc**)
	Algebraic Functions	($x^3, x+5, 1/x,$ **etc**)
	Trig Functions	($\sin(5x), \tan(x),$ **etc**)
dv	**E**xponential Functions	($e^{3x}, 5^{3x},$ **etc**)

Functions that appear at the top of the list are more like to be *u,* functions at the bottom of the list are more like to be *dv.*

Integration By "Parts"

If $u = f(x)$ and $v = g(x)$ and if $f'(x)$ and $g'(x)$ are continuous, then

$\int u\,dx = uv - \int v\,du$.

Note: The goal of the procedure is to choose u and dv so that $\int v\,du$ is easier to solve than the original problem.

Suggestion:

When "choosing" u, remember **L.I.A.T.E**, where **L** is the logarithmic function, **I** is an inverse trigonometric function, **A** is an algebraic function, **T** is a trigonometric function, and **E** is the exponential function. Just choose u as the first expression in **L.I.A.T.E** (and dv will be the remaining part of the integrand). For example, when integrating $\int x \ln x\,dx$, choose $u = \ln x$ since **L** comes first in **L.I.A.T.E**, and $dv = x\,dx$. When integrating $\int xe^x\,dx$, choose $u = x$, since x is an algebraic function, and **A** comes before **E** in **L.I.A.T.E**, and $dv = e^x dx$. One more example, when integrating $\int x\,Arc\tan(x)\,dx$, let $u = Arc\tan(x)$, since **I** comes before **A** in **L.I.A.T.E**, and $dv = x\,dx$.