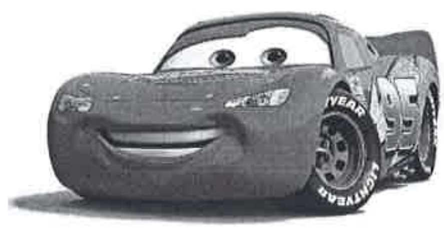
IB Math HL2: Integration by parts and Repeated by parts **Name:** ______________ **Period:** ________

Integration by parts: $\int u(dv) = (uv) - \int v\,du$



Do not Drink and Derive!

$\int \arcsin x\,dx$

$u = \arcsin x$	$dv = dx$
$du = \frac{1}{\sqrt{1-x^2}}\,dx$	$v = x$

$\Rightarrow \int \arcsin x\,dx = x \arcsin x - \int \frac{x}{\sqrt{1-x^2}}\,dx$

$u = 1-x^2$
$du = -2x\,dx$
$-\frac{1}{2}du = x\,dx$

$\Rightarrow \int \frac{-\frac{1}{2}du}{\sqrt{u}} = -\sqrt{u}$

$= \boxed{x \arcsin x + \sqrt{1-x^2} + C}$

$\int x^2 \sin 4x\,dx$

① Method I

$u = x^2$ $dv = \sin 4x\,dx$
$du = 2x\,dx$ $v = -\frac{1}{4}\cos 4x$

$\Rightarrow -\frac{1}{4}x^2 \cos 4x + \int (2x)\frac{1}{\cancel{4}_{2}}\cos 4x\,dx$

By parts again

$u = \frac{1}{2}x$ $dv = \cos 4x\,dx$
$du = \frac{1}{2}dx$ $v = \frac{1}{4}\sin 4x.$

$\Rightarrow -\frac{1}{4}x^2 \cos 4x + \frac{1}{8}x \sin 4x - \frac{1}{8}\int \sin 4x\,dx$

$= \boxed{-\frac{1}{4}x^2 \cos 4x + \frac{1}{8}x \sin 4x + \frac{1}{32}\cos 4x + C}$

② Method II (Tabular method)

u	dv
x^2	$\sin 4x$
$2x$	$-\frac{1}{4}\cos 4x$
2	$-\frac{1}{16}\sin 4x$
0	$+\frac{1}{64}\cos 4x$

$+$ $-$ $+$ $-$

Same Answer.

$\int e^{3x} \sin x\,dx$

u	dv
e^{3x}	$\sin x$
$3e^{3x}$	$-\cos x$
$9e^{3x}$	$-\sin x$

$+$ $-$ $+$

$\Rightarrow \int e^{3x} \sin x\,dx = -e^{3x}\cos x + 3e^{3x}\sin x - 9\int e^{3x}\sin x\,dx$

combine

$\Rightarrow$

$10\int e^{3x}\sin x\,dx = -e^{3x}\cos x + 3e^{3x}\sin x + C$

$\Rightarrow \boxed{\int e^{3x}\sin x\,dx = \frac{-1}{10}e^{3x}\cos x + \frac{3}{10}e^{3x}\sin x + C}$