Substitution

$$\int 2x e^{x^2}\,dx = \int e^y\,dy = e^y + c = e^{x^2} + c$$

$y = x^2$

$dy = 2x\,dx$

$(e^{x^2}+c)' = e^{x^2}\cdot 2x$ ✓

$$\int \frac{(\arctan(x^3))^2}{1+x^6}\cdot 3x^2\,dx = \int \frac{(\arctan y)^2}{1+y^2}\,dy$$

$(x^3)^2$

$y = x^3$

$dy = 3x^2\,dx$

$$= \int (\arctan y)^2 \cdot \frac{1}{1+y^2}\,dy = \int t^2\,dt = \frac{t^3}{3}$$

$t = \arctan y$

$dt = \frac{1}{1+y^2}\,dy$

$$= \frac{1}{3}(\arctan y)^3$$

$$= \frac{1}{3}(\arctan x^3)^3$$

Per parts (By parts)

$$\int u'v = uv - \int uv'$$

$$\int x \cdot \ln x \, dx = \frac{x^2}{2}\ln x - \int \frac{x^2}{2}\cdot\frac{1}{x}\,dx$$

$u' = x \quad v = \ln x$

$u = \frac{x^2}{2} \quad v' = \frac{1}{x}$

~~$u' = \ln x \quad v = x$~~

~~$u = 2 \quad v' = 1$~~

$$= \frac{x^2}{2}\ln x - \frac{1}{2}\int x\,dx = \frac{x^2}{2}\ln x - \frac{1}{2}\cdot\frac{x^2}{2} + C$$

$$\int 1 \cdot \arctan x \, dx = x\arctan x - \int x\frac{1}{1+x^2}dx$$

$u' = 1 \quad v = \arctan x$

$u = x \quad v' = \frac{1}{1+x^2}$

$$= x\arctan x - \frac{1}{2}\ln(1+x^2) + C$$

$$\frac{1}{2}\int \underline{2x}\cdot\frac{1}{1+x^2}\underline{dx} = \frac{1}{2}\int \frac{1}{y}\,dy = \frac{1}{2}\ln|y| + C$$

$$= \frac{1}{2}\ln(1+x^2) + C$$

$y = 1 + x^2$

$dy = 2x\,dx$

$\int \ln x \qquad \int 1\cdot\arctan$

$$\int e^x \sin x\,dx = e^x \sin x - \int e^x \cos x\,dx$$

$u' = e^x \quad v = \sin x$

$u = e^x \quad v' = \cos x$

$u' = e^x \quad v = \cos x$

$u = e^x \quad v' = -\sin x$

$$= e^x \sin x - \left(e^x \cos x - \int e^x(-\sin x)\,dx\right)$$

$$\int e^x \sin x\,dx = e^x \sin x - e^x \cos x - \int e^x \sin x\,dx$$

$$2\int e^x \sin x\,dx = e^x(\sin x - \cos x)$$

$$\int e^x \sin x\,dx = \frac{e^x}{2}(\sin x - \cos x) + C$$

$e^{ax}\cos(bx)$ $\sin$

$e^{2x}\cos(-x)$

$\sin x \cdot \sin x$

$\cos x \cdot \cos x$

} PP

$\int \sin x \cdot \cos x$ Subs.

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1) Is there $f \cdot f'$ → Subst.

$\int 2x e^{x^2} dx$ A

$\int x^2 e^{2x} dx$ B PP

PP? B

S? A

$y = x^2$

$dy = 2x\,dx$