

$$10) \int \frac{dx}{x \ln x^4}$$

$$u = \ln(x^4) \quad 10) \underline{\hspace{2cm}}$$

$$du = \frac{4x^3}{x^4} = \frac{4}{x} dx$$

$$\frac{1}{4} du = \frac{1}{x} dx \quad 11) \underline{\hspace{2cm}} C$$

$$\frac{1}{4} \int \frac{1}{u} du \quad 12) \underline{\hspace{2cm}} .$$

(e^-2x for the test...)

$$= \frac{1}{4} \ln u + C \quad 13) \underline{\hspace{2cm}} .$$

$$= \frac{1}{4} \ln(\ln(x^4)) + C$$

Solve the initial value problem.

$$1) \frac{dy}{dx} = x \sin 4x \text{ and } y=4 \text{ when } x=0$$

$$y = \int x \sin 4x \, dx$$

$$\int u \, dv = uv - \int v \, du \quad 11)$$

$$u = x \quad du = 1 \, dx$$

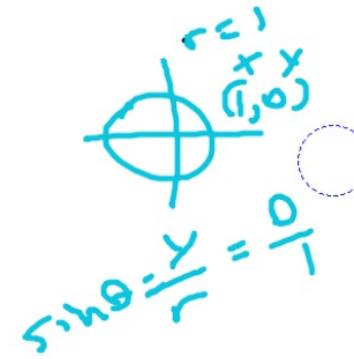
$$dv = \sin 4x \, dx \quad v = -\frac{1}{4} \cos 4x$$

$$y = \int x \sin 4x \, dx = (x) \left(-\frac{1}{4} \cos 4x \right) - \int -\frac{1}{4} \cos 4x \, dx + C$$

$$y = -\frac{x}{4} \cos 4x + \frac{1}{4} \int \cos 4x \, dx + C$$

$$y = -\frac{x}{4} \cos 4x + \frac{1}{4} \left(\frac{1}{4} \sin 4x \right) + C$$

$$y = 0 + 0 + C \quad C = -4$$



$$12) \frac{dy}{dx} = x e^{-2x} \text{ and } y = 6 \text{ when } x = 0$$

$$\begin{aligned} y &= \int x e^{-2x} dx + C = (x) \left(-\frac{1}{2} e^{-2x} \right) - \int \left(-\frac{1}{2} e^{-2x} \right) dx \\ u &= x \quad du = dx & dv = e^{-2x} dx & v = -\frac{1}{2} e^{-2x} \\ & \quad \boxed{\begin{aligned} u &= x \\ du &= dx \\ v &= -\frac{1}{2} e^{-2x} \end{aligned}} & \quad \boxed{\begin{aligned} dv &= e^{-2x} dx \\ v &= -\frac{1}{2} e^{-2x} \end{aligned}} & \quad = \frac{-x}{2} e^{-2x} + \frac{1}{2} \int e^{-2x} dx + C \\ y &= \frac{-x}{2} e^{-2x} - \frac{1}{4} e^{-2x} + C \\ 6 &= 0 - \frac{1}{4} + C \quad C = 6 \quad \boxed{\frac{25}{4}} \end{aligned}$$

Use tabular integration to find the antiderivative.

13) $\int x^3 \cos 6x \, dx$ (fair warning-I could replace $\cos 6x$ with e^{-2x} for the test...)

13) _____

u	$d v$
x^3	$\cos 6x$
$3x^2$	$1 \sin 6x$
$6x$	$\frac{1}{6} \cos 6x$
6	$\frac{1}{36} \sin 6x$
0	$\frac{1}{216} \cos 6x$

$$\begin{aligned} &= \frac{x^3}{6} \sin 6x + \frac{3x^2}{36} \cos 6x \\ &\quad - \frac{6x \sin 6x}{1296} - \frac{6}{1296} \cos 6x + C \\ &= \frac{x^3}{6} \sin 6x + \frac{x^2}{12} \cos 6x \\ &\quad - \frac{6x \sin 6x}{216} - \frac{1}{216} \cos 6x + C \end{aligned}$$