1. $\int \frac{\ln x}{x^2}\,dx$

2. $\int \tan^3 3x \sec 3x \, dx$

3. $x(t) = 2\cos^3 t,\ y(t) = 2\sin^3 t,$
$t = 0 .. \frac{\pi}{2}$

4. $x(t) = t - \sin t \quad y(t) = 1 - \cos t$
$t = 0 .. 2\pi$

1. $\int \frac{\ln x}{x^2}\,dx$

$u = \ln x \quad dv = x^{-2}$

$du = \frac{1}{x}\,dx \quad v = -\frac{1}{x}$

$uv - \int v\,du$

$\frac{\ln x}{-x} + \int \frac{1}{x}\left(\frac{1}{x}\right) dx$

$\frac{-\ln x}{x} - \frac{1}{x} + C$

$u = \frac{1}{x^2} \qquad dv = \ln x\,dx$

works too

$du = d(x^{-2})$

$= -2x^{-3}$

$= \frac{-2}{x^3}\,dx$

1. $\int \tan^3 3x \sec 3x \, dx =$ Max Z

$\int \frac{\sin^3 3x}{\cos^4 3x} dx \rightarrow \frac{1}{3} \int \frac{\sin x(1-\cos^2 x)}{\cos^4 x} dx$

$dv = -\sin x$

$u = \cos x$

$-\frac{1}{3} \int \left(\frac{1}{u^4} - \frac{1}{u^2}\right) du = -\frac{1}{3}\left(\frac{u^{-3}}{-3} + u^{-1}\right)$

(substitute 3x in)

$-\frac{1}{3}\left(\frac{1}{-3\cos^3 x} + \frac{1}{\cos x}\right) \rightarrow \frac{\sec^3 3x}{9} - \frac{\sec 3x}{3} + C$

Timmy B.

$x(t) = 2\cos^3 t \quad y(t) = 2\sin^3 t \quad t = 0..\pi/2$

$x'(t) = 6\cos^2 t \cdot -\sin t \qquad y'(t) = 6\sin^2 t \cdot \cos t$

$x'(t)^2 = 36\cos^4 t \sin^2 t \qquad y'(t)^2 = 36\sin^4 t \cdot \cos^2 t$

$$\int_0^{\pi/2} \sqrt{36\cos^4 t\sin^2 t + 36\sin^4 t\cos^2 t}\, dt$$

$$\int \sqrt{36(\cos^4 t\sin^2 t + \sin^4 t\cos^2(t)}\, dt$$

$$\int \sqrt{36\cos^2 t\sin^2 t(\cos^2 t + \sin^2 t)}\, dt \rightarrow 1$$

$$\int \sqrt{36\cos^2 t\sin^2 t}\, dt$$

$$6\int \cos t \sin t\, dt$$

$$6\left(\frac{-\cos^2 t}{2}\right)\Bigg|_0^{\pi/2}$$

$0 - -3$

$\boxed{3}$

also

$$3\int \frac{2\sin t\cos t}{}\, dt$$

$\text{''} = \sin 2t$

$x(t) = t - \sin t$

$x'(t) = 1 - \cos t$

$(x'(t))^2 = (\cos t - 1)^2$

$y(t) = 1 - \cos t$

$y'(t) = \sin t$

$(y'(t))^2 = \sin^2 t$

Done

$$\int_a^b \sqrt{x'(t)^2 + y'(t)^2}\, dt$$

$$\int_0^{2\pi} \sqrt{(\cos t - 1)^2 + \sin^2 t}\, dt$$

$$\int \sqrt{\cos^2 t - 2\cos t + 1 + \sin^2 t}\, dt$$

$$\int \sqrt{(1 - \sin^2 t) - 2\cos t + 1 + \sin^2 t}\, dt$$

$$\int \sqrt{-2\cos t + 2}\, dt$$

$$\int \sqrt{4\left(\frac{1 - \cos t}{2}\right)}$$

$$\int \sqrt{4\left(\frac{-\cos^2 + 1}{2}\right)}$$

$$\int \sqrt{4\sin^2 \frac{t}{2}}$$

$\frac{t}{2} = \theta$

$t = 2\theta$

$dt = 2\,d\theta$

$$\int 2\sin\theta \cdot 2\,d\theta$$

$$-4\cos\theta \Big|_0^{2\pi}$$

$$-4\cos\frac{t}{2}\Big|_0^{2\pi}$$

$$-4\cos\pi + 4\cos 0$$

$$-4(-1) + 4 \cdot 1$$

$$4 + 4$$

$$L = 8$$