Dodgy Integrals if you know about integration ...

1. Find the area under the curve:

$y=\frac{1}{x^2}$ between $x=-1$ and $x=1$

DIAGRAM?

The area is above the x axis, so the integral will be positive.

Show that:

$$\int_{-1}^{1}\frac{1}{x^2}dx=...=-2$$

2. Now:

$\int(sinxcosx)dx=\frac{1}{2}\sin^2 x$ check by differentiation

And:

$\int(sinxcosx)dx=-\frac{1}{2}\cos^2 x$ check by differentiation

So:

$$\frac{1}{2}\sin^2 x=-\frac{1}{2}\cos^2 x$$

So:

$$\sin^2 x+\cos^2 x=0$$

3. Now:

$\int\left(\frac{1}{7x}\right)dx=\frac{1}{7}lnx$ check by differentiation

And:

$\int\left(\frac{1}{7x}\right)dx=\frac{1}{7}\ln 7x$ check by differentiation

So:

$$lnx=\ln 7x$$

4. Using integration by parts, show that:

$$\int\left(\frac{1}{x}\right)dx=\int 1\times\left(\frac{1}{x}\right)dx=x\frac{1}{x}+\int\left(\frac{1}{x}\right)dx$$

So:

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

So:

$$0 = 1$$

5. Now:

$$\int 2\sin 2x dx = -\cos 2x$$ check by differentiation

And:

$$\int 2\sin 2x dx = 2\sin^2 x$$ check by differentiation

So:

$$-\cos 2x = 2\sin^2 x$$

6. Let:

$$I = \int_0^{\pi} \cos^2 x dx$$

So:

$$I = \int_0^{\pi} cosxcosxdx = \int_0^{\pi} \sqrt{1-\sin^2 x}\, cosxdx$$

Use the substitution:

$$sinx = t$$

Show:

$$cosxdx = dt$$

Show that:

I= $\int_0^0 \sqrt{1-t^2} dt = 0$

7. Now:

$$sec^2 x \geq 0$$

So:

$$\int_0^{\pi} sec^2 xdx > 0$$

But:

$$\int_0^{\pi} sec^2 xdx = [tanx]_0^{\pi} = 0$$