# Quiz No 1

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Subject Applied Calculus

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**Q No 1** $\int_0^1 \frac{4t^3-2t^2+3t-1}{2t^2+1}\,dt$

**Sol** $\int_0^1 \frac{4t^3-2t^2+3t-1}{2t^2+1}\,dt$

polynomial long division

$= \int_0^1 \left(\frac{t}{2t^2+1} + 2t - 1\right)dt$

Apply linearity

$\int \frac{t}{2t^2+1}\,dt + 2\int t\,dt - \int 1\,dt$

**Now Solving**

$\int \frac{t}{2t^2+1}\,dt \Rightarrow \frac{1}{4}\int \frac{1}{u}\,du \Rightarrow \int \frac{1}{u}\,du$

$\Rightarrow \frac{1}{4}\int \frac{1}{u}\,du =$

$= \frac{\ln(u)}{4}$

$= \frac{\ln(2t^2+1)}{4}$

**Now Solving**

$\int t\,dt$

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

Now Solving

$$= \int 1\,dt$$

$$= \int \frac{t}{2t^2+1}\,dt + 2\int t\,dt - \int 1\,dt$$

$$= \frac{\ln(2t^2+1)}{4} + t^2 - t$$

$$= \frac{\ln(2t^2+1)}{4} + t^2 - t + c$$

Rewrite / simplify

$$= \frac{\ln(2t^2+1)}{4} + (t-1)t - c$$

$$\frac{\ln(2t^2+1)}{4} + \frac{2t^2-2t}{2} + c$$

$$\frac{\ln(2t^2+1) + 4t^2 - 4t}{4} + c$$

$$\int_0^1 f(t)\,dt = \frac{\ln(3)}{4}$$

$$= 0.2746$$

## Q No 2

Find $\int_2^3 t \sin t^2 dt$

Sol

$$\int_2^3 t \sin t^2 dt$$

Substitute $v = t^2$ $\quad \frac{dv}{dt} = 2t$ $\quad dt = \frac{1}{2t} dv$

$$= \frac{1}{2} \int \sin(v) dv$$

Now solving

$$\int \sin(v) dv$$

$$= -\cos(v)$$

$$\int_2^3 \frac{1}{2} \sin(v) dv$$

$$= -\frac{\cos(v)}{2}$$

replace $v = t^2$

$$= -\frac{\cos t^2}{2}$$

$$= -\frac{\cos(t^2)}{2} + C$$

$\int f(t) dt = f(t) =$ $\quad -\frac{\cos(t^2)}{2} + C$

$$\int_2^{\square} f(t)\,dt = \frac{\cos(4)}{2} - \frac{\cos(9)}{2}$$

Simplify and rewrite

$$-\frac{\cos(9)-\cos(4)}{2}$$

$$= 0.1287$$