Now $f(x+dx) \approx y+dy$

$= f(x)+dy \quad \because \quad y=f(x)$

$\Rightarrow \sqrt[4]{16+1} \approx \sqrt[4]{16}+0.03125$

$\Rightarrow \sqrt[4]{17} \approx \left(2^4\right)^{\frac{1}{4}}+0.03125$

$= 2+0.03125 = 2.03125$

Question # 3(ii)

Let $y=f(x)=(x)^{\frac{1}{3}}$

Where $x=8$ & $dx=dx=0.2$

Taking differential of above

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

$= \frac{1}{3}(x)^{-\frac{2}{3}}dx = \frac{1}{3x^{\frac{2}{3}}}dx$

Put $x=8$ and $dx=0.2$

$dy = \frac{1}{3(8)^{\frac{2}{3}}}(0.2)$

$= \frac{1}{3\left(2^3\right)^{\frac{2}{3}}}(0.2) = \frac{1}{3(4)}(0.2)$

$= 0.01667$

Now $f(x+dx) \approx y+dy$

$= f(x)+dy \quad \because \quad y=f(x)$

$\Rightarrow (8+0.2)^{\frac{1}{3}} = (8)^{\frac{1}{3}}+0.01667$

$\Rightarrow (8.02)^3 = 2+0.01667$

$= 2.01667$

Question # 3(iii)

Let $y = f(x) = x^{\frac{1}{5}}$

Where $x=32$ & $dx=dx=-1$

Try yourself as above.

Question # 3(iv)

Let $y=f(x)=\cos x$

Where $x=30^\circ$ & $dx=-1=-\frac{p}{180}$ rad

$=-0.01745$ rad

Now $dy = d(\cos x)$

$= -\sin x\, dx$

Put $x=30^\circ$ and $dx=dx=-0.01745$

$dy = -\sin 30^\circ(-0.01745)$

$= -(0.5)(-0.01745) = 0.008725$

Now $f(x+dx) \approx y+dy$

$= f(x)+dy$

$\Rightarrow \cos(30-1) = \cos 30^\circ+0.008725$

$\Rightarrow \cos 29^\circ = 0.866+0.008725$

$= 0.8747$

Question # 3(v)

Let $y=f(x)=\sin x$

Where $x=60^\circ$ & $dx=1^\circ=\frac{p}{180}$ rad

$=0.01745$ rad

Now $dy = d(\sin x)$

$= \cos x\, dx$

Put $x=60^\circ$ and $dx=dx=0.01745$

$dy = \cos 60^\circ(0.01745)$

$= (0.5)(0.01745) = 0.008725$

Now $f(x+dx) \approx y+dy$

$= f(x)+dy$

$\Rightarrow \sin(60+1) = \sin 60^\circ+0.008725$

$\Rightarrow \sin 61^\circ = 0.866+0.008725$

$= 0.8747$

Question # 4

Let x be the length of side of cube where

$x=5$ & $dx=5.02-5=0.02$

Assume V denotes the volume of the cube.

Then $V = x\cdot x\cdot x$

$= x^3$

Taking differential

$dV = 3x^2dx$

Put $x=5$ & $dx=dx=0.02$

$dV = 3(5)^2(0.02)$

$= 1.5$

Hence increase in volume is 1.5 cubic unit.

Question # 5

Let x denotes diameter of a disc

Where $x=44$ cm & $dx=44.4-44=0.4$

Then radius $= \frac{x}{2}$

Let A denotes the area of the disc

Then $A = p(\text{radius})^2$

$= p\left(\frac{x}{2}\right)^2 = \frac{p}{4}x^2$

Taking differential

$dA = d\left(\frac{p}{4}x^2\right)$

$= \frac{p}{4}\cdot 2x\cdot dx = \frac{p}{2}x\, dx$

Put $x=44$ and $dx=dx=0.4$

$dA = \frac{p}{2}(44)(0.4)$

$= (3.14)(22)(0.4)$

$= 27.65$

Hence change in area is 27.65 cm^2

---- The End ----

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