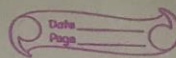


Ex 13.2



Ex 13.2

(1) $y = \frac{x^2}{2} + 3x$, $x=2$ and $dx=0.5$ find Δy , dy

Ans: 2.625

$$f(x) = \frac{x^2}{2} + 3x$$

$$\begin{aligned} \Delta y &= f(x+dx) - f(x) \\ &= f(2+0.5) - f(2) \\ &= \left(\frac{(2.5)^2}{2} + 3 \times 2.5 \right) - \left(\frac{4}{2} + 6 \right) \\ &= 2.625 \end{aligned}$$

$$\begin{aligned} d(y) &= f'(x) dx \\ &= f'(2) \times 0.5 \\ &= (2+3) \times 0.5 \\ &= 2.5 \end{aligned}$$

$$\begin{aligned} \therefore \text{difference} &= \Delta y - dy \\ &= 2.625 - 2.5 \\ &= 0.125 // \end{aligned}$$

(2) find app change in vol of cube of side x m, change is 1%. find % in change in vol?

Answer:

$$l = x \text{ m}$$

$$\Delta dx = 1\% \text{ of } x = 0.01x$$

$$d(V) = x^3$$

$$\frac{d(V)}{dx} = 3x^2$$

$$= 3x^2 \times dx$$

$$= 3x^2 \times 0.01x$$

$$= 0.03x^3$$

$$\text{change in vol} = \frac{0.03x^3}{x^3} \times 100$$

$$= 3\%$$

Q.no.3) Use differentials to find app. change in x^3 as x changes from 5 to 5.01.

Answer:

Given,

$$\Delta x = 0.01$$

$$x = 5$$

Let $y = f(x) = x^3$

diff. b.s. w.r to 'x' we get,

$$\frac{d(y)}{d(x)} = 3x^2$$

$$= 3x^2 \times dx$$

$$= 3 \times 5^2 \times (0.01)$$

$$= 0.75 //$$

Q.no.4) find an approximate change in $1/x$ as x changes from 1 to 0.98.

Answer:

$$x = 1 \text{ and } x + \Delta x = 0.98$$

$$1 + \Delta x = 0.98$$

$$\Delta x = 0.2$$

now,

$$y = x^{-1}$$

diff. b.s. w.r to 'x', we get,

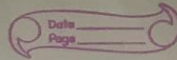
$$\frac{d(y)}{d(x)} = -x^{-2}$$

$$= -x^{-2} \times dx$$

$$= -(x)^{-2} \times 0.02$$

$$= -0.02 //$$

DONT COPY QUESTION



Q. No 9] A circular copper plate is heated so that its radius increases from 5 cm to 5.06 cm. Find the approximate increase in area and also the actual increase in area.

Answer

Given,

$r = 5$ (where r is radius of circular plate)

$$r + \Delta r = 5.06$$

$$\text{or, } 5 + dr = 5.06$$

$$\text{or, } dr = 0.06$$

Area of circle $(A) = \pi r^2$

$$A = f(r) = \pi r^2$$

Diff. b.s.w.r. to 'x' we get;

$$\frac{d(A)}{dr} = 2\pi r$$

$$= 2\pi r dr$$

$$= 2\pi (5)(0.06)$$

$$= 0.6\pi \text{ cm}^2 //$$

Again,

$$\Delta(A) = f(r + \Delta r) - f(r)$$

$$= f(5.06) - f(5)$$

$$= \pi (5.06)^2 - \pi (5)^2$$

$$= 0.6036 \pi //$$

[6]

Find the approximate increase in the surface area of a cube if the edge increases from 10 to 10.01 cm. Calculate % error.

Answer:

Given,

length of cube $(x) = 10 \text{ cm}$

$$\text{and } x + \Delta x = 10.01$$

$$\text{or, } 10 + \Delta x = 10.01$$

$$\text{or, } \Delta x = 0.01$$

Now,

$$\text{T.S.A. of cube } (A) = 6x^2$$

$$\text{i.e. } A = f(x) = 6x^2$$

for approximate change in area,
diff. b.s.w.r. to 'x' we get,

$$\frac{d(A)}{dx} = 12x$$

$$\begin{aligned} \text{or, } dA &= 12x \cdot dx \\ &= 12 \times 10 \times 0.01 \\ &= 1.2 \text{ cm}^2 // \end{aligned}$$

Again,

$$\begin{aligned} \Delta x &= f(x + \Delta x) - f(x) \\ &= f(10.01) - f(10) \\ &= (1.2006) \text{ cm}^2 // \end{aligned}$$

$$\text{Error \%} = \frac{\Delta A - dA}{A} \times 100 \%$$

$$= \left(\frac{6 \times 10^{-4}}{600} \right) \%$$

$$= 1 \times 10^{-4} \%$$

Q. No. 7) Find the approximate increase in the volume of a sphere when its radius increases from 2 to 2.1. Find also the actual increase and compare the two values.

Answer:

Given,

$$x = 2, \Delta x = 0.1$$

$$V = \frac{4}{3} \pi x^3$$

$$f(x) = V = \frac{4}{3} \pi x^3$$

diff. b.s. w.r. to 'x' we get,

$$V' = \frac{4}{3} \times 3 \times \pi \times x^2$$

$$= 4 \times \pi x^2 dx$$

$$= 4 \times \frac{22}{7} \times [2]^2 \times 0.1$$

$$= 1.6\pi,$$

$$\begin{aligned} \Delta A &= f(x + \Delta x) - f(x) \\ &= f(2 + 0.1) - f(2) \\ &= \frac{2.044\pi}{3} \end{aligned}$$