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Q 1 Ans (a)

Solution =

Let

x and y = The number

z = Sum of Their cubes

$\Rightarrow k = x + y$

$\Rightarrow y = k - x$

$\Rightarrow z = x^3 + y^3$

$\Rightarrow z = x^3 + (k-x)^3$

$\Rightarrow dz/dx = 3x^2 + 3(x-x)^2(-1) = 0$

$\Rightarrow x^2 - (k^2 - 2kx + x^2) = 0$

$x = 1/2x$

$y = k - 1/2x$

$y = 1/2k$

$z = (1/2k)^3 + (1/2k)^3$

$z = 1/4k^3$

Ans (b) Solution:

Let x and y = The numbers

$\Rightarrow x + y = 2 \longrightarrow$ Equation (1)

$\Rightarrow 1 + y' = 0 \quad y' = -1$

$\Rightarrow z = x^3 + y^2 \rightarrow$ Equation (2)

$\Rightarrow dz/dx = 3x^2 + 2yy' = 0$

$\Rightarrow 3x^2 + 2y(-1) = 0$

$\Rightarrow y = 3/2\, x^2$

From equation (1)

$\Rightarrow x + 3/2x^2 = 2$

$\Rightarrow 2x + 3x^2 = 4$

$\Rightarrow 3x^2 + 2x - 4 = 0$

$\Rightarrow x = 0.8685$ and -1.5352

use

$\Rightarrow x = 0.8685$

$\Rightarrow y = 32(0.8685^2)$

$\Rightarrow y = \cancel{0.8}\ 1.1315$

$\Rightarrow z = 0.8685^3 + 1.1315^2$

$\Rightarrow z\ 1.9354$ Answer

Q2 Ans (a)

Solution:

We now That The linear approximation formula is:

$\Rightarrow f(x) \simeq L(x) = f(a) + f'(a)(x-a)$

$\Rightarrow$ Now. Substitute The value in The

$\Rightarrow$ formula, we get:

$\Rightarrow L(x) = f(3) + f'(3)(x-3) = 18 - 2x$

Hence, $f(3.5) = 18 - 2(3.5)$

$\Rightarrow f(3.5) = 18 - 7$

$\Rightarrow f(3.5) = 11$

(2) Ans (b)

Solution

Let $f(x) = (x)^{1/3}$

and $a = 8 \Rightarrow$

we have to calculate $(9)^{1/3}$

Now by liner aproximation we

Know That $f(x)$ $f(a) + f'(a)(x-a)$

So $f(x)' = \dfrac{1}{3\,x^{2/3}}$

$a = 8$

$\Rightarrow f(a) = f(8) = \sqrt[3]{8} = (2^3)^{1/3} = 2$

$\Rightarrow f'(a) = \dfrac{1}{3(8)^{2/3}} = \dfrac{1}{3(2^3)^{2/3}} = \dfrac{1}{3(4)} = 1/12$

and $x - a = (9-8) = 1$

$f(x) = f(a) + f'(a) * (x-a)$

$\Rightarrow$ Putting The value:

$\Rightarrow f(9) = 9^{1/3} = 2 + 1/12\,(9-8)$

$= 2 + 1/12 \times 1 = \dfrac{25}{12}$

2.0833 Ans

Q(3) Ans

Solution:

$\Rightarrow (2y + x^2 2 + 1)\, dy/dx + (2xy - 9x^2 2) = 0$

$\Rightarrow$ We can rewrite this as

$\Rightarrow (2y + x^2 2 + 1)\, dy + (2xy - 9x^2 2)\, dx = 0$

$\Rightarrow$ check for exactness:

$\Rightarrow$ Let $M = 2xy - 9x^2 2$

$\Rightarrow$ Let $N = 2y + x^2 2 + 1$

$\partial M / \partial y = \partial N / \partial x$

$\partial(2xy - 9x^2 2)/\partial y = \partial(2y + x^2 2 + 1)/\partial x$

$2x = 2x$

Thus it is indeed exact. To further solve

$dF/dx = M = 2xy - 9x^2 2$

$\int dF = \int (2xy - 9x^2 2)\, dx$

$F = (x^2 2) y - 3x^3 3 + g(y)$

=> To get $g(y)$ we differential it partially with respect to y:

$$\Rightarrow \partial F/\partial y = \partial/\partial y\,(x^2/2)y - 3x^2/3 + g(y) = N$$

$$\Rightarrow \partial F/\partial y = x^2/2 + g'(y) = N$$

$$x^2/2 + g'(y) = 2y + x^2/2 + 1$$

$$\Rightarrow g'(y) = 2y + 1$$

=> integrating:

$$\Rightarrow g(y) = y^2/2 + y + c$$

=> There for:

$$F = (x^2/2)y - 3x^2/3 + y^2/2 + y + c$$

End