Q14 : Sand is pouring from a pipe at the rate of 12 cm^3/s. The falling sand forms a cone on the ground in such a way that the height of the cone is always one-sixth of the radius of the base. How fast is the height of the sand cone increasing when the height is 4 cm?

Answer :

The volume of a cone (*V*)with radius (*r*) and height (*h*)is given by,

$V = \frac{1}{3}\pi r^2 h$

It is given that,

$h = \frac{1}{6}r \Rightarrow r = 6h$

$\therefore V = \frac{1}{3}\pi(6h)^2 h = 12\pi h^3$

The rate of change of volume with respect to time (*t*)is given by,

$\frac{dV}{dt} = 12\pi \frac{d}{dh}(h^3)\cdot\frac{dh}{dt}$ [By chain rule]

$= 12\pi(3h^2)\frac{dh}{dt}$

$= 36\pi h^2 \frac{dh}{dt}$

It is also given that $\frac{dV}{dt} = 12 \text{ cm}^3/\text{s}$.

Therefore, when *h*= 4 cm, we have:

$12 = 36\pi(4)^2 \frac{dh}{dt}$

$\Rightarrow \frac{dh}{dt} = \frac{12}{36\pi(16)} = \frac{1}{48\pi}$

Hence, when the height of the sand cone is 4 cm, its height is increasing at the rate of $\frac{1}{48\pi}$ cm/s.

Answer needs Correction? Click Here

Q15 : The total cost *C*(*x*) in Rupees associated with the production of *x*units of an item is given by

$C(x) = 0.007x^3 - 0.003x^2 + 15x + 4000$

Find the marginal cost when 17 units are produced.

Answer :

Marginal cost is the rate of change of total cost with respect to output.

$\therefore$Marginal cost (MC)$= \frac{dC}{dx} = 0.007(3x^2) - 0.003(2x) + 15$

$= 0.021x^2 - 0.006x + 15$

When *x* = 17, MC = 0.021 (17^2) - 0.006 (17) + 15

= 0.021(289) - 0.006(17) + 15

= 6.069 - 0.102 + 15

= 20.967

Hence, when 17 units are produced, the marginal cost is Rs. 20.967.

Answer needs Correction? Click Here

Q16 : The total revenue in Rupees received from the sale of *x* units of a product is given by

$R(x) = 13x^2 + 26x + 15$

Find the marginal revenue when *x*= 7.

Answer :

Marginal revenue is the rate of change of total revenue with respect to the number of units sold.

$\therefore$Marginal Revenue (MR) $= \frac{dR}{dx}$ = 13(2*x*) + 26 = 26*x* + 26

When *x* = 7,

MR = 26(7) + 26 = 182 + 26 = 208

Hence, the required marginal revenue is Rs 208.

Answer needs Correction? Click Here

Q17 : The rate of change of the area of a circle with respect to its radius *r* at *r* = 6 cm is

(A) 10Ââ,¬ (B) 12Ââ,¬ (C) 8Ââ,¬ (D) 11Ââ,¬

Answer :

The area of a circle (*A*)with radius (*r*) is given by,

$A = \pi r^2$

Therefore, the rate of change of the area with respect to its radius *r*is

$\frac{dA}{dr} = \frac{d}{dr}\left(\pi r^2\right) = 2\pi r$.

∴When r = 6 cm,

$\frac{dA}{dr} = 2\pi \times 6 = 12\pi \text{ cm}^2/\text{s}$

Hence, the required rate of change of the area of a circle is $12\pi \text{cm}^2/\text{s}$.

The correct answer is B.

Answer needs Correction? Click Here

Q18 : The total revenue in Rupees received from the sale of *x* units of a product is given by $R(x) = 3x^2 + 36x + 5$. The marginal revenue, when $x = 15$ is

(A) 116 (B) 96 (C) 90 (D) 126

Answer :

Marginal revenue is the rate of change of total revenue with respect to the number of units sold.

∴Marginal Revenue (MR) $= \frac{dR}{dx} = 3(2x) + 36 = 6x + 36$

∴When x = 15,

MR = 6(15) + 36 = 90 + 36 = 126

Hence, the required marginal revenue is Rs 126.

The correct answer is D.

Answer needs Correction? Click Here

********** END **********