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| **CLASS 12** | **APPLIED MATHEMATICS 241** |  |
| **QUESTION BANK** | **CHAPTER::APPLICATION OF**    **DERIVATIVES** |  |

1. The interval on which the function *f*(*x*) = 2*x*3 + 9*x*2 + 12*x* – 1 is decreasing is

(a) [ - 1, ∞ ) (b) ( - ∞, - 2] (c) [ -2, - 1] (d) [ -1, 1]

1. The interval in which the function *f*(*x*) = 2*x*3 + 3*x*2- 12*x* + 1 is strictly increasing is

(a) [- 2, 1] (b) ( - ∞ , - 2] (c) ( - ∞, 1] (d) ( - ∞, - 1] U [2, ∞ )

1. The function *f*(x) = *x*4 – 4*x* is strictly
   1. Decreasing in [1, ∞ )
   2. increasing in [1, ∞)
   3. increasing in ( - ∞, 1]
   4. increasing in [ - 1, 1]
2. If *x* is real, the minimum value of *x*2 – 8*x* + 17 is

(a) – 1 (b) 0 (c) 1 (d) 2

1. The smallest value of the polynomial *x*3- 18*x*2 + 96*x* on [0, 9] is

(a) 126 (b) 135 (c) 160 (d) 0

1. The maximum value of

(a) *e* (b) 2*e* (c)

log 𝑥

𝑥 1

𝑒

is

2

(b)

𝑒

1. The maximum slope of the curve *y* = - *x*3 + 3*x*2+ 9*x* – 27 is

(a) 0 (b) 12 (c) 16 (d) 32

𝑏

1. The least value of the function *f*(*x*) = *ax* +

𝑥

( *a* > 0, *b* > 0, *x* > 0) is

(a) √𝑎𝑏 (b) 2 √𝑎𝑏 (c) *ab* (d) 2*ab*

1. For manufacturing a certain item, the fixed cost is Rs. 9000 and the variable cost of producing each unit is Rs. 30. The average cost of producing 60 units is

(a) Rs. 150 (b) Rs. 180 (c) Rs. 240 (d) Rs. 120

1. If the cost function of a certain commodity is C(*x*) = 2000 + 50*x* - average cost of producing 5 units is

1 *x*2, then the

5

(a) Rs. 451 (b) Rs. 450. (c) Rs. 449 (d) Rs. 2245

1. If the selling price of a commodity is fixed at Rs.45 and the cost function is C(*x*) = 30*x* + 240, then the breakeven point is

(a) *X* = 10 (b) *x* = 12 (c) *x* = 15 (d) *x* = 16

1. The fixed cost of a product is Rs.1800 and the variable cost per unit is Rs.55. If the demand function is *p*(*x*) = 400 – 15*x*, then the breakeven values are at

(a) *x =* 10, 15 (b) *x* = 8, 15 (c) *x* = 8, 20 (d) *x* = 12, 15

1. The demand function of a monopolist is given by *x* = 100 – 4*p*. The quantity at which MR (marginal revenue) = 0 will be

(a) 25 (b) 10 (c) 50 (d) 40

1. If the demand function for a product is *p* =

80−𝑥

4

, where *x* is the number of units and

*p* is the price per unit, then the value of *x* for which the revenue will be maximum is

(a) 40 (b) 20 (c) 10 (d) 80

1

1. If the total cost of producing *x* units of a commodity is given by C(*x*) =

3

3000, then the marginal cost when *x* = 5 is

(a) Rs. 25 (b) Rs. 20 (c) Rs. 30 (d) Rs. 50

*x*3 + *x*2

– 15*x* +

1. If the total cost function is given by C(*x*) = 10*x* – 7*x*2 + 3*x*3, then the marginal average cost function (MAC) is given by

(a) 10 – 14*x* + 9*x*2 (b) 10 – 7*x* + 3*x*2 (c) – 7 + 6*x* (d) – 14 + 18 *x*

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1. If the demand function is *p*(*x*) = 20 -

2

, then the marginal revenue when *x* = 10 is

(a) Rs. 5 (b) Rs. 10 (c) Rs. 15 (d) Rs. 150

1. If the total cost function of producing *x* units of a commodity is given by

360 – 12*x* + 2*x*2 , then the level of output at which the total cost is minimum is

(a) 24 (b) 12 (c) 6 (d) 3

1. If the function *f*(*x*) = *x*2 – *kx* + 5 is increasing on [2, 4], then

(a) *k*  (2,  ) (b) *k*  (-  , 2) (c) *k*  (4, ) (d) *k*  (-  , 4)

1. The least value of the function *f*(*x*) = *x*3 – 18*x*2 + 96*x* in the interval [0, 9] is

(a) 126 (b) 135 (c) 160 (d) 0

1. The least and greatest values of *f*(*x*) = *x*3 – 6*x*2 + 9*x* in [0, 6] are

(a) 3, 4 (b) 0, 6 (c) 0, 3 (d) 3, 6

1. Case Study : A cable network provider in a small town has 500 subscribers and he used to collect Rs.300 per month from each subscriber. He proposes to increase the monthly charges and it is believed from past experience that for every increase of Rs.1, one subscriber will discontinue the service.

Based on the above information, answer the following questions:

1. If Rs. *X* is the monthly increase in subscription amount, then the number of subscribers are

(a) *x* (b) 500 – *x* (c) *x* – 500 (d) none of these

1. Total revenue ® is given by (in Rs.)

(a) R = 300*x* + 300(500 – *x*) (b) R = (300 + *x*)(500 + *x*)

(c) R = (300 + *x*) (500 – *x*) (d) R = 300x + 500 (*x* + 1)

1. The number of subscribers which gives the maximum revenue is

(a) 100 (b) 200 (c) 300 (d) 400

1. What is the increase in charges per subscriber that yields maximum revenue?

(a) *x* = Rs. 100 (b) *x* = Rs.200 (c) *x* = Rs. 300 (d) *x* = Rs. 400

1. The maximum revenue generated is

(a) Rs. 2,00,000 (b) Rs. 1,80,000 (c) Rs. 1,60,000 (d) Rs. 1,50,000

1. The minimum value of *x*2 + 250 is

𝑥

(a) 75 (b) 55 (c) 50 (d) 25

1. Case Study: A company is planning to launch a new product and decides to pack the new product in closed right circular cylindrical cans of volume 432𝜋 cm3. The cans are to be made from tin sheet. The company tried different options.

Based on the above information, answer the following questions:

1. If *r* cm is the radius of the base of the cylinder and *h* cm is height, then

(a) *rh* = 216 (b) *r*(*r* +*h*) = 216 (c) *rh*2 = 432 (d) *r2h* = 432

1. If S cm2 is the surface area of the closed cylindrical can, then

(a) S = 2𝜋 (*r*2 + 432 ) (b) S = 𝜋 (*r*2 + 864 ) (c) S = 𝜋 (*r*2 + 432 ) (d) S = 432𝜋

𝑟 𝑟

1. For S to be minimum *r* is equal to

𝑟 𝑟

(a) 3 cm (b) 6 cm (c) 8 cm (d) 12 cm

1. Minimum surface are of cylindrical can is

(a) 54 𝜋 cm2 (b) 108 𝜋 cm2 (c) 216 𝜋 cm2 (d) none of these

1. The relation between the radius and the height of cylindrical can of minimum surface are is
   1. Height is equal to radius of the base
   2. Height is equal to twice the radius of base
   3. Radius is equal to twice the height
   4. Radius is two-third of the height.
2. The minimum value of the function *f*(*x*) = 2*x*3 + 5 is

(a) 1 (b) 0 (c) 5 (d) none of these

1. The maximum value of the function *f*(*x*) = - |*x* + 3| + 5 is

(a) 3 (b) 0 (c) 5 (d) 6

1. Average revenue is the same as

(a) Cost price (b) price per unit (c) marginal cost (d) marginal revenue

1. If a function *f* has a second derivative at *x* = *c* such that *f* ‘ (*c*) = 0 and *f* ‘’ (*c*) > 0, then

*c* is a point of

(a) Local maxima. (b) local minima (c) minima (d) maxima

1. If price per unit *p* = 30 – *x* and the cost function C(*x*) = 16*x* + 45, then breakeven point(s) is (are)

(a) *X* = 2, 3 (b) *x* = 5, 9 (c) *x* = 4, 9 (d) *x* = 3, 5

1. The function *f*(*x*) = *ax – b* is strictly increasing on R if and only if

(a) *a* < 0 (b) *a* = 0 (c) *a* > 0 (d) *a* ≥ 0

1. Case study : Sudhir has a piece of tin rectangular sheet. He is going to cut squares from each corners and fold up the sides to form a open box.

Based on this information, answer the following questions.

1. If *x* is the side of square cut off from each corner of the sheet, then what is the length of open box?

(a) 45 – *x* (b) 45 – 2*x* (c) 45 + 2*x* (d) none of these

1. What is the width of the open box?

(a) 24 – *x* (b) 24 + *x* (c) 24 – 2*x* (d) none of these

1. Volume ‘V’ of open box is given by

(a) V = (45 – *x*)(24 – *x*) *x* (b) V = (45 + *x*)(24 + *x*) *x* (c) V = (45 + 2*x*)(24 + 2*x*) *x*

(d) (45 – 2*x*)(24 – 2*x*) *x*

1. What should be the side of square to be cut off so that the volume of box is maximum?

(a) 18 cm (b) 5 cm (c) both (a) and (b) (d) none of these

1. The maximum value of V (in cm3) is

(a) 5400 (b) 4200 (c) 3600 (d) 2450