**MATHEMATICS**

**PAGEMAKER10**

**A.O.D.**

Q1. A function is matched below against an interval where it is supposed to be increasing. Which of the following parts is incorrectly matched?

**Interval Function**

(a)

(b)

(c)

(d)

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Q2. The function is an increasing function in

(a)

(b)

(c)

(d)

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Q3. The function decreases in the interval

(a)

(b)

(c)

(d) None of these

L1Difficulty1

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Q4. The function assumes the minimum value of given by

(a) 5

(b)

(c) 3

(d) 2

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Q5. Which of the following statements is always true?

(a) If is increasing, then is decreasing.

(b) If is increasing, then is also increasing.

(c) If and are positive function and is increasing and is decreasing, then is a decreasing function.

(d) If and are positive function and is decreasing and is increasing, then is a decreasing function.

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Q6. Let be a differentiable function for all values of and has the property that and have opposite signs for all values of Then,

(a) is an increasing function

(b) is a decreasing function

(c) is a decreasing function

(d) is an increasing function

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Q7. Let Then is

(a) increasing in decreasing in

(b) increasing in decreasing in

(c) increasing in

(d) None of these

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Q8. Let be a differentiable function If the tangent drawn to the curve at any point always lies below the curve, then

(a)

(b)

(c)

(d) None of these

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Q9. If where denotes the fractional part of , then is decreasing in

(a)

(b)

(c)

(d)

L1Difficulty1

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Q10. Function is monotonically increasing when

(a)

(b)

(c)

(d)

L1Difficulty1

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Q11. Let be continuous and differentiable function such that and have opposite signs everywhere. Then

(a) is increasing

(b) is decreasing

(c) is non-monotonic

(d) is decreasing

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Q12. If the function increases in the interval and then

(a) increases in

(b) decreases in

(c) We cannot say that increases or decreases in

(d) None of these

L1Difficulty1

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Q13. If is a polynomial function and and then

(a)

(b)

(c)

(d) None of these

L1Difficulty1

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Q14. Which of the following statements is true for the function

(a) It is monotonic increasing

(b) fails to exist for three distinct real values of

(c) changes its sign twice as varies from to.

(d) The function attains its extreme values at and such that

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Q15. If and then is increasing in

(a)

(b)

(c)

(d)

L1Difficulty1

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**Solutions**

S1. Ans. (d)

Sol.

When

 is increasing

S2. Ans. (a)

Sol.

Here

For

Hence, is increasing in .

S3. Ans. (c)

Sol.

S4. Ans. (c)

Sol.

 gives and for all

 is minimum for

S5. Ans. (d)

Sol.

If increases then increases.

****

If increases, then

 decreases

If and are ve functions and and then

S6. Ans. (c)

Sol.

 is a decreasing function.

S7. Ans. (a)

Sol.

 (domain is

Now if

Thus, increases in and decreases in .

S8. Ans. (c)

Sol.

****

(a) :

****

(b) :



(c) :



(d) :

Clearly for [in Fig. (6.66(c)] tangent always lies below the graph.

Or (in Fig. 6.66(d)) tangent always lies below the graph.

S9. Ans. (a)

Sol.

For

Also, for

 decreases in

Similarly, we can check for other given options say for ,

Here decreases only in otherwise in other intervals is constant.

S10. Ans. (d)

Sol.

****

Graph of the function is that ) clearly increases in

S11. Ans. (d)

Sol.

Now as and keep opposite sign, then

.

Hence is decreasing.

S12. Ans. (c)

Sol.

We do not know the sign of in , so we cannot say about the sign of

S13. Ans. (a)

Sol.

Given

 is an increasing function

Since is a polynomial.

S14. Ans. (c)

Sol.

Function is increasing in function is decreasing in

****

 is local maxima, local minima

Derivable

Continuous

S15. Ans. (d)

Sol.

Since is increasing

So,

Also,

So, is increasing in .

**LEVEL-II**

Q1. Let be a function such that If is decreasing for all real values of , then

(a)

(b)

(c)

(d)

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Q2. If then

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

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Q3. The length of the largest continuous interval in which the function is monotonic is

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

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Q4. then decreases in

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

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Q5. The number of solutions of the equations in is

(a) one

(b) two

(c) three

(d) zero

L3Difficulty3

Qtag Mathematics

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Q6. is monotonically increasing in

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

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Q7. monotonically decreases in

(a) 

(b)

(c)

(d) 

L3Difficulty3

Qtag Mathematics

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Q8. If is a monotonically decreasing function of in the largest possible interval , then

(a)

(b)

(c)

(d) has no real value

L3Difficulty3

Qtag Mathematics

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Q9. | monotonically decreases in

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

Qcreator Pagemaker10

Q10. Given that for all real , and then for all belongs to

(a)

(b)

(c)

(d) None of these

L3Difficulty3

Qtag Mathematics

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Q11. A function is defined as and is an increasing function, then is increasing in the interval

(a)

(b)

(c)

(d) None of these

L3Difficulty3

Qtag Mathematics

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Q12. Let be a function defined as below:

d and Then at

(a) has a local maximum

(b) has a local minimum

(c) is discontinuous

(d) None of these

L3Difficulty3

Qtag Mathematics

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Q13. The greatest value of is (where represents the greatest integer function)

(a)

(b)

(c)

(d) None of these

L3Difficulty3

Qtag Mathematics

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Q14. The maximum value of the function in the interval occurs at

(a)

(b)

(c)

(d)

L3Difficulty3

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Q15. Let

Then on this function has

(a) a minimum

(b) a maximum

(c) either a maximum or a minimum

(d) neither a maximum nor a minimum

L3Difficulty3

Qtag Mathematics

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**Solutions**

S1. Ans. (b)

Sol.

We must have

S2. Ans. (c)

Sol.

 and

Clearly

Also, is increasing whereas is decreasing.

Thus

S3. Ans. (b)

Sol.

For the continuous domain in

and in

So the required largest continuous interval is length =

S4. Ans. (a)

Sol.

****

let

Hence, decreases in

S5. Ans. (d)

Sol.

Let

Now the least value of is

and the greatest value of

 is strictly an increasing function

also and

Thus, for the given interval, never becomes zero.

Hence, the number of roots is zero.

S6. Ans. (a)

Sol.

d

For,

Now, the graph of is

****

Clearly from the graph, increases in

S7. Ans. (b)

Sol.

Sign scheme of

****

 if decreases if

S8. Ans. (a)

Sol.

Here

Then situations for is as follow:

****

Given that decreases in the largest possible interval

 then must have roots and

 Product of roots is

S9. Ans. (b)

Sol.

For

 increases for and decreases for

 Graph of

|  |  |
| --- | --- |
| (a) | **12.png** |

 Graph of

|  |  |
| --- | --- |
| (b) | **13.png** |

From the graph, decreases in

S10. Ans. (b)

Sol.

Let

 is an increasing function and

Therefore, and

S11. Ans. (b)

Sol.

if , (as is an increasing function)

If

S12. Ans. (b)

Sol.

  

Thus, and

Hence, is a point of minima.

S13. Ans. (b)

Sol.

Since for all Therefore, for all

S14. Ans. (a)

Sol.

D

Its maximum value = when

 when

S15. Ans. (d)

Sol.

 and hence is neither a maximum nor a minimum.

**LEVEL-III**

Q1. The maximum value of is

(a)

(b)

(c)

(d)

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Q2. The maximum slope of the curve is

(a) 0

(b) 12

(c) 16

(d) 32

L5Difficulty5

Qtag Mathematics

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Q3. Let The absolute minimum value of is

(a) 0

(b)

(c)

(d) None of these

L5Difficulty5

Qtag Mathematics

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Q4. The minimum value of is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q5. The maximum value of is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q6. If then the maximum value of is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q7. The global maximum value of is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q8. The least natural number for which is

(a) 1

(b) 2

(c) 5

(d) None of these

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q9. A function is defined by The local maximum value of the function is

(a) 1

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q10.

Complete set of values of such that as a local minima at is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q11. Let the function be defined as follows

Then has

(a) a local minimum at

(b) a global maximum at

(c) an absolute minimum at

(d) an absolute maximum at

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q12. A differentiable function has a relative minimum at then the function has a relative minimum at for

(a) all and all

(b) all if

(c) all

(d) all

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q13. If and

then has the value equal to

(a)

(b) 9/4

(c) 13/4

(d) 5/2

L5Difficulty5

Qtag Mathematics

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Q14. The set of value(s) of for which the function

 possesses a negative point of inflection is

(a)

(b)

(c)

(d) empty set

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

Q15. Suppose that is a polynomial of degree 3 and that at any of the stationary point. Then

(a) has exactly one stationary point

(b) must have no stationary point

(c) must have exactly two stationary points

(d) has either zero or two stationary point

L5Difficulty5

Qtag Mathematics

Qcreator Pagemaker10

**Solutions**

S1. Ans. (c)

Sol.

For maximum or minimum

For changes sign from positive to negative as passes through 1.

Therefore, is maximum for and maximum value

= .

S2. Ans. (b)

Sol.

Let the slope of tangent to the curve at any point be (say)

 for all

Therefore, is maximum when i.e., when

Therefore, maximum slope =

S3. Ans. (b)

Sol.

 for all .

 is increasing in

So, the absolute minimum =

S4. Ans. (c)

Sol.

Given

Clearly, the minimum value occurs when as

S5. Ans. (d)

Sol.

Sign scheme of

****

Hence, is maximum at Maximum value =

S6. Ans. (c)

Sol.

Since A.M. G.M.

Hence, maximum value of is .

S7. Ans. (b)

Sol.

Let

 for

 is increasing in

S8. Ans. (b)

Sol.

Let

Also

d is the point of minima.

For are must have

Hence, the least value of is 2.

S9. Ans. (c)

Sol.

We have

Let then

Now or

 the maximum value =

S10. Ans. (b)

Sol.

Clearly, in decreasing just before and increasing after For to be the point of local minima, .

 d

S11. Ans. (c)

Sol.

****

S12. Ans. (b)

Sol.

Since has a relative minimum at therefore and

If the function has a relative minimum at then

 at for

Now,

Hence, has a relative minimum at if and can attain any real value.

S13. Ans. (d)

Sol.

****

Hence

S14. Ans. (a)

Sol.

 which is the point of inflection

Given that, we must have

S15. Ans. (d)

Sol.

The derivative of a degree 3 polynomial is quadratic. This must have either 0, 1 or 2 roots. If this has precisely one root, then this must be repeated. Hence, we have where is the repeated root and So, our original function has a critical point at

Also, in which case . But we are told that the 2nd derivative is non-zero at critical point. Hence, there must be either 0 or 2 critical points.