**MATHEMATICS**

**PAGEMAKER10**

**DIFFERENTIAL EQUATIONS**

Q1. The differential equation of all parabolas whose axis are parallel to the -axis is

(a)

(b)

(c)

(d)

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Q2. A differential equation associated to the primitive is (where is th derivative w.r.t. )

(a)

(b)

(c)

(d) None of these

Where represents th order derivative.

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Q3. The differential equation of all circles which pass through the origin and whose centres lie on the -axis is

(a)

(b)

(c)

(d)

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Q4. The form of the differential equation of the central conics is

(a)

(b)

(c)

(d) None of these

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Q5. The differential equation for the family of curve where is an arbitrary constant, is

(a)

(b)

(c)

(d)

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Q6. If = where then is expressed explicitly as

(a)

(b)

(c)

(d)

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Q7. If where is an arbitrary constant) is the general solution of the differential equation then the function is

(a)

(b)

(c)

(d)

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Q8. The differential equation whose general solution is given by, where are arbitrary constants, is

(a)

(b)

(c)

(d)

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Q9. The solution to the differential equation where is

(a)

(b)

(c)

(d)

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Q10. If and the equals

(a)

(b)

(c)

(d)

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**Solutions**

S1. Ans. (a)

Sol.

The equation of a member of the family of parabolas having axis parallel to -axis is

 (1)

where and are arbitrary constants

Differentiating equation (1) w.r.t. we get (2)

which on again differentiating w.r.t. gives (3)

Differentiating (3) w.r.t we get

S2. Ans. (c)

Sol.

Differentiating the given equation successively, we get

 (1)

 (2)

 (3)

Multiplying equation (1) by 7 and then adding to equation (2), we get (4)

Multiplying equation (1) by 5 and then subtracting it from equation (2),

we get (5)

Putting the values of and , obtained from equation (4) and (5), respectively, in equation (1), we get

S3. Ans. (a)

Sol.

If be the centre on -axis than its radius will be as it passes through origin. Hence its equation is

or (1)

 = [by (1)]

or

S4. Ans. (c)

Sol.

Differentiating w.r.t. , we get

 (1)

Again differentiating w.r.t. , we get

From equations (1) and (2), we get

S5. Ans. (c)

Sol.

The given family of curve is (1)

Differentiating w.r.t. we get

 [Using equation (1)]

S6. Ans. (c)

Sol.

We have

So I.F. =

 General solution is given by

As so

But (Rejected)

Hence

S7. Ans. (d)

Sol.

differentiating w.r.t.

S8. Ans. (b)

Sol.

 (1)

Where are arbitrary constant

 (2)

 (3)

 (4)

From equations (1) + (3), (5)

From equations (2) + (4), (6)

From equations (5) + (6), we get

S9. Ans. (a)

Sol.

Hence, the equation of the curve is log

S10. Ans. (a)

Sol.

Integrating, we get

 when where is constant.

 or

Now put

**LEVEL-II**

Q1. The equation of the curves through the point and whose slope is is

(a)

(b)

(c)

(d) None of these

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Q2. The solution of the equation is

(a)

(b)

(c)

(d)

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Q3. The solution of the equation is

(a)

(b)

(c)

(d) None of these

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Q4. The solution of the equation is given by

(a)

(b)

(c)

(d) None of these

L3Difficulty3

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Q5. Solution of differential equation is

(a)

(b)

(c)

(d)

L3Difficulty3

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Q6. The solution of is

(a) d

(b)

(c)

(d)

L3Difficulty3

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Q7. The solution of the equation is

(a)

(b)

(c)

(d) None of these

L3Difficulty3

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Q8. Solution of is

(a)

(b)

(c)

(d)

L3Difficulty3

Qtag Mathematics

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Q9. The general solution of the differential equation is

(a)

(b)

(c)

(d)

L3Difficulty3

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Q10. The solutions of is

(a)

(b)

(c)

(d)

L3Difficulty3

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Q11. The solution of is

(a)

(b)

(c)

(d)

L3Difficulty3

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Q12. The slope of the tangent at to a curve passing through is given by then the equation of the curve is

(a)

(b)

(c)

(d) None of these

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Q13. If then the solution of the equation is

(a)

(b)

(c)

(d) None of these

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Q14. The solution of differential equation is

(a)

(b)

(c)

(d)

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Q15. The solution of is

(a)

(b)

(c)

(d) None of these

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Q16. The solution of is

(a)

(b)

(c)

(d)

L3Difficulty3

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Q17. The slope of the tangent at to a curve passing through a point is then the equation of the curve is

(a)

(b)

(c)

(d)

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Q18. Solution of the differential equation is

(a)

(b)

(c)

(d) None of these

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Q19. The general solution of the differential equation, where is a known function, is

(a)

(b)

(c) 1

(d)

where is an arbitrary constant.

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Q20. The solution of satisfying is given by

(a) a system of parabolas

(b) a system of circles

(c)

(d)

L3Difficulty3

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**Solutions**

S1. Ans. (a)

Sol.

Slope =

Putting we get

The equations is

S2. Ans. (d)

Sol.

S3. Ans. (b)

Sol.

or

S4. Ans. (a)

Sol.

S5. Ans. (a)

Sol.

S6. Ans. (a)

Sol.

S7. Ans. (b)

Sol.

Putting we get The given equation can be written as

S8. Ans. (a)

Sol.

where

 is the required solution.

S9. Ans. (b)

Sol.

We have

S10. Ans. (a)

Sol.

Putting we have and the given equations reduces to

S11. Ans. (a)

Sol.

S12. Ans. (c)

Sol.

We have,

Putting so that we get

On integration, we get

tan

This passes through therefore .

So,

S13. Ans. (d)

Sol.

Put

S14. Ans. (a)

Sol.

The given equation can be written as

Above equation is a homogeneous equation.

Putting we get

 variable separable

Now integrating both sides, we get

 [ constant]

or

or

or

S15. Ans. (b)

Sol.

Let

equation reduces to

 where

S16. Ans. (c)

Sol.

The intersection of and is Put

The given equation reduced to .

putting we get

S17. Ans. (a)

Sol.

 (1)

Put

 equation (1) transforms to

It passes through .

S18. Ans. (b)

Sol.

The given equation is written as

S19. Ans. (a)

Sol.

I.F. =

Hence, the solution is

 where

 =

S20. Ans. (c)

Sol.

Rewriting the given equation is

Putting we have

I.F.

 solution is

Since so

Hence which represents a system of hyperbola.

**LEVEL-III**

Q1. The integrating factor of the differential equation is given by

(a)

(b)

(c)

(d)

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Q2. The solution of the differential equation is

(a)

(b)

(c)

(d) None of these

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Q3. Integrating factor of differential equation is

(a)

(b)

(c)

(d)

L5Difficulty5

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Q4. Solution of the equation when is

(a)

(b)

(c)

(d)

L5Difficulty5

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Q5. If integrating factor of is , then is equal to

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

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Q6. A function satisfies

If then is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

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Q7. The solution of the differential equation is

(a)

(b)

(c)

(d) None of these

L5Difficulty5

Qtag Mathematics

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Q8. The general solution of the equation is

(a)

(b)

(c)

(d) None of these

L5Difficulty5

Qtag Mathematics

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Q9. The solution of the differential equation

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

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Q10. The solution of the differential equation where as

(a)

(b)

(c)

(d)

L5Difficulty5

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Q11. The solution of the differential equation 2 given is

(a)

(b)

(c)

(d)

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Q12. Solution of the differential equation is

(a)

(b)

(c)

(d) None of these

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Q13. Which of the following is not the differential equation of family of curves whose tangent form an angle of with the hyperbola

(a)

(b)

(c)

(d) None of these

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Q14. Tangent to a curve intercepts the -axis at a point A line perpendicular to this tangent through passes through another point (1, 0). The differential equation of the curve is

(a)

(b)

(c)

(d) None of these

L5Difficulty5

Qtag Mathematics

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Q15. The differential equation of the curve for which the initial ordinate of any tangent is equal to the corresponding subnormal

(a) is linear

(b) is homogeneous of second degree

(c) has separable variables

(d) is of second order

L5Difficulty5

Qtag Mathematics

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Q16. Orthogonal trajectories of family of the curve where is any arbitrary constant, is

(a)

(b)

(c)

(d)

L5Difficulty5

Qtag Mathematics

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Q17. The function satisfies the differential equation

(a)

(b)

(c)

(d)

L5Difficulty5

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Q18. Differential equation of the family of curves where and are arbitrary constants, is

(a)

(b)

(c)

(d) None of these

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Q19. The solution of the differential equation where is

(a)

(b)

(c)

(d) None of these

L5Difficulty5

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Q20. The solution of the differential equation

 is

(a)

(b)

(c)

(d)

L5Difficulty5

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**Solutions**

S1. Ans. (c)

Sol.

 I.F. =

 =

 =

S2. Ans. (c)

Sol.

The given equation can be rewritten as

 (1)

which is linear. Also

 and

 [resolving into partial fractions]

 I.F. =

Hence the required solution of equation (1) is

S3. Ans. (c)

Sol.

 I.F. =

S4. Ans. (c)

Sol.

The given differential equation can be written as which is linear differential equation of first order.

 where

 the solution is,

When

S5. Ans. (d)

Sol.

which is of the form

Its integrating factor is

Here

S6. Ans. (b)

Sol.

I.F =

 solution is

Given

S7. Ans. (a)

Sol.

Putting the last equation can be written as .

I.F. =

 solution is

S8. Ans. (d)

Sol.

I.F.

Hence solution is

 is not further integrable.

S9. Ans. (b)

Sol.

 which is linear

I.F. =

 solution is

S10. Ans. (a)

Sol.

 (linear)

I.F.

 solution is sec

Given

Hence equation of curve is

S11. Ans. (d)

Sol.

when

 Equation of curve is

S12. Ans. (a)

Sol.

Integrating, we get

S13. Ans. (b)

Sol.

By condition,

 or

 or

 or

S14. Ans. (a)

Sol.

****

The equation of the tangent at the point

 is

The coordinates of the point are

The slope of the perpendicular line

through is

 which is the required differential

 equation to the curve at

S15. Ans. (a)

Sol.

If is the curve,

 is the equation of the tangent at

Putting the initial ordinate of the tangent is therefore .

The subnormal at the point is given by , so we have

This is a homogeneous equation and, by rewriting it as we see that it is also a linear equation.

S16. Ans. (b)

Sol.

S17. Ans. (a)

Sol.

We have

[using Leibnitz’s Rule]

 [

S18. Ans. (c)

Sol.

 (1)

 (2)

 (3)

Eliminating A between equations (2) and (3), we get

S19. Ans. (c)

Sol.

When and

 Integrating again

 when

 . Integrate again

Also when

S20. Ans. (a)

Sol.

hence the differential equation becomes

put

 I.F. =