

FBQ1: The theory of differential equations involves the interplay of \_\_\_\_\_ and their derivatives.

Answer: \*Function\*

FBQ2: An equation involving one (or more) dependent variable derivatives with respect to one or more ----- variables is called a differential equation.

Answer: \*Independent\*

FBQ3:  $dydx=2y-2x^2+3$  is an example of \_\_\_\_\_ differential equation

Answer: \*Ordinary\*

FBQ4: Isaac Newton was able to model the motion of a particle by an equation involving an unknown function and one or more of its \_\_\_\_\_

Answer: \*Derivative\*

FBQ5: Given a function of two variables  $z=f(x, y)$ ;  $\partial z/\partial x$  is the \_\_\_\_\_ partial derivative of  $z$  with respect to  $x$  and it is obtained by differentiating  $z$  with respect

Answer: \*first order\*

FBQ6: Given a function of two variables  $z=f(x, y)$ ;  $\partial z/\partial y$  is the first order partial derivative of  $z$  with respect to  $y$  and it is obtained by differentiating  $z$  with respect

Answer: \*X\*

FBQ7: Differential equations are divided into three classes, namely; ordinary, partial and \_\_\_\_\_

Answer: \*Total\*

FBQ8: The order of a differential equation is the order of the \_\_\_\_\_ order derivative appearing in the equation.

Answer: \*Highest\*

FBQ9: The degree of a differential equation is the highest ----- of the highest order derivative appearing in it after the equation has been expressed in the form free from radicals and any fractional power of the derivatives or negative power.

Answer: \*Exponent\*

FBQ10: The equation  $x^2-y^2dydx^2=r^2+dydx$

Answer: \*Three\*

FBQ11: The equation  $\partial^2 z/\partial x^2+\partial^2 z/\partial y^2=0$

Answer: \*Partial\*

FBQ12: The equation  $dydx=ex+y$  is a good example of \_\_\_\_\_ equation.

Answer: \*Separable\*

FBQ13: The equation  $dydx=exy$  is \_\_\_\_\_ a separable equation.

Answer: \*not\*

FBQ14: The equation  $dydx=ex+y$  \_\_\_\_\_ a separable equation.

Answer: \*Is\*

FBQ15:  $hx, y=x^3+2x^2y+3xy^2+4y^3$  is \_\_\_\_\_ of degree

Answer: \*Homogeneous\*

FBQ16: A differential equation  $y'=f(x,y)$  is called a homogeneous differential equation when  $f$  is a homogeneous \_\_\_\_\_ of degree 0

Answer: \*Function\*

FBQ17: An exact differential equation is formed by equating an exact

differential to \_\_\_\_\_

Answer: \*Zero\*

FBQ18: A factor, which when multiplied with a non-exact differential equation makes it \_\_\_\_\_, is known as an integrating factor.

Answer: \*Exact\*

FBQ19: A differential equation is \_\_\_\_\_ if the dependent variable and all its derivatives appear only in the first degree and also there is no term involving the product of the derivatives or any derivative and the dependent variable.

Answer: \*Linear\*

FBQ20: A differential equation is linear if the \_\_\_\_\_ variable and all its derivatives appear only in the first degree and also there is no term involving the product of the derivatives or any derivative and the dependent variable.

Answer: \*Dependent\*

FBQ21: Given that  $dydx + Pxy = Qx$  is the general form of the linear equation of the first order, where  $Px$  and  $Qx$  < /

Answer: \*non-homogeneous\*

FBQ22: Given that  $dydx + Pxy = Qx$  is the general form of the linear equation of the first order, where  $Px$  and  $Qx$  < /

Answer: \*Homogeneous\*

FBQ23:  $Fx, y, c = x + y + c = 0$  represents a family of \_\_\_\_\_ straight lines; each line corresponds to precisely one value of the parameter  $c$

Answer: \*Parallel\*

FBQ24:  $Fx, y, c = x^2 + y^2 + c^2 = 0$  represents a family of concentric \_\_\_\_\_ of radius  $c$  with centre at the origin.

Answer: \*Circles\*

FBQ25: A set of functions  $y_1x, y_2x, \dots, y_nx$  defined on an interval  $I$  is linearly

Answer: \*Dependent\*

FBQ26: Method of undetermined coefficients is applicable if the equation is a \_\_\_\_\_ equation with constant coefficients

Answer: \*Linear\*

FBQ27: Method of undetermined coefficients is applicable if the \_\_\_\_\_ term is either a polynomial, an exponential function, a sinusoidal function or a product of these functions

Answer: \*non-homogeneous\*

FBQ28: If we know one solution of the homogeneous linear differential equation of the second order, we can solve the non-homogeneous equation by the method of \_\_\_\_\_ and obtain both a particular solution and a second linearly independent solution of the homogeneous equation.

Answer: \*reduction of order\*

FBQ29: If we know one solution of the homogeneous linear differential equation of the second order, we can solve the non-homogeneous equation by the method of reduction of order and obtain both a particular solution and a second linearly independent solution of the \_\_\_\_\_ equation.

Answer: \*Homogeneous\*

FBQ30: The differential equation  $x^3d^3ydx^3 + x^2d^2ydx$  < /

Answer: \*Euler's\*

FBQ31: The three classes of differential equation are; ordinary, total and

Answer: \*Partial\*

FBQ32: Given  $y^2\frac{\partial z}{\partial x} + xy\frac{\partial z}{\partial y} = nz$ ;  $\frac{\partial z}{\partial x}$  is a \_\_\_\_\_ derivative of  $z$  with respect to  $x$ .

Answer: \*Partial\*

FBQ33: Given  $y^2\frac{\partial z}{\partial x} + xy\frac{\partial z}{\partial y} = nz$ ;  $\frac{\partial z}{\partial y}$  is a partial derivative of  $z$  with respect to  $y$ .

Answer: \*X\*

FBQ34: The partial derivatives of a function of two variables  $z = f(x, y)$  with respect to one of the \_\_\_\_\_ variables  $x$ , can be defined as  $\frac{\partial z}{\partial x} = \frac{\partial f}{\partial x}$ .

Answer: \*Independent\*

FBQ35: The partial derivatives of a function of two variables  $z = f(x, y)$  with respect to one of the independent variables \_\_\_\_\_ can be defined as  $\frac{\partial z}{\partial x} = \frac{\partial f}{\partial x}$ .

Answer: \*X\*

FBQ36: Given a function of two variables  $z = f(x, y)$ ;  $\frac{\partial z}{\partial x}$  is the first order partial derivative of  $z$  with respect to  $x$  and it is obtained by differentiating  $z$  with respect to  $x$ .

Answer: \*Constant\*

FBQ37: The most obvious classification of differential equations is based on the \_\_\_\_\_ of the dependent variable and its derivative (or derivatives) in the equation.

Answer: \*Nature\*

FBQ38: The most obvious classification of differential equations is based on the nature of the dependent \_\_\_\_\_ and its derivative (or derivatives) in the equation.

Answer: \*Variable\*

FBQ39: \_\_\_\_\_ differential equation is the equation involving only derivatives (that is, derivatives with respect to a single independent variable).

Answer: \*Ordinary\*

FBQ40: If  $y = f(x)$  is a given function then its derivation  $\frac{dy}{dx}$  can be interpreted as the rate of change of \_\_\_\_\_ with respect to  $x$ .

Answer: \*Y\*

FBQ41: The primary purpose of differential equations is to serve as a tool for studying \_\_\_\_\_ in the physical world.

Answer: \*Change\*

FBQ42: Sir Isaac Newton observed that certain important laws of natural sciences can be phrased in terms of \_\_\_\_\_ involving rates of change.

Answer: \*Equations\*

FBQ43: \_\_\_\_\_ differential equation is the equation containing partial derivatives of one (or more) dependent variable with respect to two or more independent variables.

Answer: \*Partial\*

FBQ44: Partial differential equation is the equation containing partial derivatives of one (or more) dependent variable with respect to two or more \_\_\_\_\_ variables.

Answer: \*Independent\*

FBQ45: The \_\_\_\_\_ of a differential equation is the order of the highest order derivative appearing in the equation.

Answer: \*Order\*

FBQ46: The differential equation  $d^2y/dx^2 + y = x^2$  is of \_\_\_\_\_ order

Answer: \*Two\*

FBQ47: The equation  $x - y dy/dx = r^2 + 1 + dy/dx$

Answer: \*Four\*

FBQ48: The equation,  $x + y^2 dy/dx = 1$ , is a/an \_\_\_\_\_ non-linear equation.

Answer: \*Ordinary\*

FBQ49: The equation  $\partial^2 z / \partial x^2 + \partial^2 z / \partial y^2 = 0$

Answer: \*Partial\*

FBQ50: In differential equation, a particular solution is any solution which is obtained from the \_\_\_\_\_ by giving particular values to the arbitrary constants.

Answer: \*general solution\*

Multiple Choice Questions (MCQs):

MCQ1: If  $y = f(x)$  is a given function then its derivation  $dy/dx$  can be interpreted as the rate of change of ----- with respect to  $x$

Answer:  $f$

MCQ2: The primary purpose of differential equations is to serve as a tool for studying ----- in the physical world

Answer: change

MCQ3: Sir Isaac Newton observed that certain important laws of natural sciences can be phrased in terms of ----- involving rates of change.

Answer: equations

MCQ4: Isaac Newton was able to model the motion of a particle by an equation involving an unknown function and one or more of its -----

Answer: directions

MCQ5: The theory of differential equations involves the interplay of ----- and their derivatives.

Answer: derivatives

MCQ6: An equation involving one (or more) dependent variable derivatives with respect to one or more independent variables is called a -----

Answer: simultaneous equation

MCQ7:  $dy/dx = 2y - 2x^2 + 3$  is an example of ----- differential equation

Answer: partial

MCQ8: Given  $y^2 \partial^2 z / \partial x^2 + xy \partial^2 z / \partial x \partial y = nz$ ;  $\partial^2 z / \partial x^2$  is a ----- derivative of  $z$

Answer: differential

MCQ9: Given  $y^2 \partial^2 z / \partial x^2 + xy \partial^2 z / \partial x \partial y = nz$ ;  $\partial^2 z / \partial y^2$  is a partial derivative of  $z$

Answer:  $x$

MCQ10: The partial derivatives of a function of two variables  $z = f(x, y)$  with respect to one of the independent variables  $x$ , can be defined as -----

Answer:  $\partial z / \partial x = \partial y / \partial x$

MCQ11: Given a function of two variables  $z = f(x, y)$ ;  $\partial^2 z / \partial x^2$  is the first order partial derivative of  $z$  with respect to  $x$  and it is obtained by differentiating  $z$  with respect

Answer: constant

MCQ12: If  $z = fx$ ,  $y$  is a function of two variables, then  $\partial z / \partial y$  is the first order partial derivative of  $z$  with respect to  $y$  and it is obtained by differentiating  $z$  with respect to  $y$ .  
Answer:  $f_y$

MCQ13: The most obvious classification of differential equations is based on the nature of the ----- variable and its derivative(or derivatives) in the equation.  
Answer: independent

MCQ14: A differential equation involving only derivatives ( that is , derivatives with respect to a single independent variable) is called an ----- differential equation.  
Answer: ordinary

MCQ15: Differential equation containing partial derivatives of one ( or more) dependent variable with respect to two or more independent variable is called a ----- differential equation.  
Answer: partial

MCQ16: The ----- of a differential equation is the order of the highest order derivative appearing in the equation.  
Answer: order

MCQ17: The differential equation  $d^2y/dx^2 + y = x^2$  is of ----- order  
Answer: 2

MCQ18: The equation,  $x + y dy/dx = 1$  is of ----- order  
Answer: 1

MCQ19: The ----- of a differential equation is the highest exponent of the highest order derivative appearing in it after the equation has been expressed in the form free from radicals and any fractional power of the derivatives or negative power.  
Answer: Degree

MCQ20: The equation  $x - y dy/dx = r^2 + 1 + dy/dx$   
Answer: 1

MCQ21: When in an ordinary or partial differential equation, the dependent variables and its derivatives occur to the degree only, and not as higher powers or products, we call the equation -----  
Answer: Linear

MCQ22: The differential equation  $d^2y/dx^2 + y = x^2$  is an ordinary ----- differential equation.  
Answer: linear

MCQ23: The equation,  $x + y^2 dy/dx = 1$  , is an ordinary ----- equation  
Answer: linear

MCQ24: The equation  $\partial^2 z / \partial x^2 + \partial^2 z / \partial y^2 = 0$   
Answer: exact

MCQ25: The solution of the  $n$ th order differential equation with arbitrary ' $n$ ' constants is called its ----- solution.  
Answer: general

MCQ26: In differential equation, any solution which is obtained from the general solution by giving particular values to the arbitrary constants is called a ----- solution.  
Answer: particular

MCQ27: The general solution of a first order differential equation normally

contains one arbitrary constant which is called a -----  
Answer: constant

MCQ28:  $Y=mx+c$  is a -----parameter family of curves  
Answer: one

MCQ29: Which of the following does not indicate situation(s) where differential equations occur naturally -----  
Answer: solving differential equation

MCQ30: Conditions on the value of the dependent variable, and its derivative, at a single value of the independent variable in the interval of existence of the solution are called the -----  
Answer: general conditions

MCQ31: The problem of solving a differential equation together with the initial conditions is called the -----  
Answer: general condition

MCQ32: The general solution of a ----- differential equation represents one-parameter family of curves.  
Answer: second order

MCQ33: The general solution of a  $n$ th order differential equation represents ----- family of curves.  
Answer:  $n$ -parameter

MCQ34: Many physical situation such as population model, Newton's law of cooling, radioactive decay, can be represented by ----- differential equations  
Answer: second order

MCQ35: An equation of the form  $dy/dx=f(x, y)$  is called a ----- if  $f(x, y)$  can be put in the form  $f(x)$ ,  $y$  &lt;  
Answer: separable equation

MCQ36: An equation of the form  $dy/dx=f(x, y)$  is called equation in variable separable form if  $f(x, y)$  can be put in the form ----- where  $X$  and  $Y$   
Answer:  $f(x)$ ,  $y=XY$

MCQ37: A real-valued function  $h(x, y)$  of two variables  $x$  and  $y$  is called a -----function of degree  $n$ , where  $n$  is a real number, if we have  $h(\lambda x, \lambda y) = \lambda^n h(x, y)$   
Answer: homogeneous

MCQ38: The function  $h(x, y) = x^3 + 2x^2y + 3xy^2 + 4y^3$  is homogeneous  
Answer: three

MCQ39: A differential equation  $y' = f(x, y)$  is called a homogeneous differential equation when  $f$  is a homogeneous function of -----  
Answer: degree 1

MCQ40: An exact differential ----- is formed by equating an exact differential to zero  
Answer: inequality

MCQ41: A factor, which when multiplied with a non-exact differential equation makes it exact, is known as an -----factor.  
Answer: exact

MCQ42: A differential equation is ----- if the dependent variable and all its derivatives appear only in the first degree and also there is no term involving the product of the derivatives or any derivative and the dependent variable.

Answer: non-linear

MCQ43: ----- differential equations can be applied in population model, radioactive decay and Newton's law of cooling.

Answer: non-linear

MCQ44: Given that  $dy/dx + Pxy = Qx$  is the general form of the linear equation of the first order, where  $Px$  and  $Qx$  < /

Answer: homogeneous

MCQ45: Given that  $dy/dx + Pxy = Qx$  is the general form of the linear equation of the first order, where  $Px$  and  $Qx$  < /

Answer: homogeneous

MCQ46:  $px + py + xy = 0$  is equivalent to -----

Answer:  $p - xp + y = 0$ .

MCQ47:  $Fx, y, c = x + y + c = 0$  represents a family of ----- lines; each line corresponds to precisely one value of the parameter  $c$

Answer: parallel circles

MCQ48:  $Fx, y, c = x^2 + y^2 + c^2 = 0$  represents a family of ----- of radius  $c$  with centre at the origin.

Answer: parallel circles

MCQ49: A set of functions  $y_1x, y_2x, \dots, y_nx$  defined on an interval  $I$  is ----- if fo

Answer: linearly non-homogeneous

MCQ50: Method of undetermined coefficients is applicable if the equation is a ----- equation with constant coefficients

Answer: non-linear