MTH401-Differential Equation

MID TERM MCQS

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Q1: Which of the following is the first order linear equation in unknown variable y?

A) $z\,{}^{dy}\!/_{dx} + (\sin x)y = \cos x$ (page48) (100% Sure)

D) $y\,{}^{dx}\!/_{dy} + (\sin y)x = \cos y$

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Q2: Which of the following function would satisfy: ${}^{dy}\!/_{dx} = {}^{d2y}\!/_{dx^2} =$ ------ $= {}^{dny}\!/_{dx^n}$?

A) $y = Ae^x$ (Confirm) (100% Sure)

B) $y = Axe^x$

B) $y = Ae^{xx}$

B) $y = Ax^x e^{xx}$

Q3: If

$y = 2 + x$

, then which of the following is true for it?

A) Its annihilator is D

C) Its annihilator operator is D^2 (pag159) (100% Sure)

B) Its annihilator operator is D^3

B) Its annihilator operator is D + 1

Q4: For the non-exact differential equation M(x,y)dx + N(x,y)dy =0, if ${}^{\partial M}\!/_{\partial y} - {}^{\partial N}\!/_{\partial x} / N$ $ is a function of x, then the integrating factor is:

A) function of x also (page40) (100% Sure)

D) function of y

D) constant

D) multi-variable function of both x and y

Q5: Which of the following are explicit solution of the differential equation: ${}^{dy}\!/_{dx} = -\,{}^{x}\!/_{y}$

A) $y = \pm\sqrt{4 + x}$

A) $y = \pm \sqrt{-4 + x^2}$

D) $y = \pm \sqrt{4 - x^2}$ (page16) (100% Sure)

D) $y = \pm \sqrt{-4 - x^2}$

Q6: For $f(x,y) = {}^{2x}\!/_{3y} + 7$, $f(t_x, t_y) =$ - - -

A) f(x,y)

A) t f(x,y) (page26) (100% Sure)

A) t^2 f(x,y)

D) t^3 f(x,y)

Q7: What is the annihilator operator of the function g(x) = 4sinx ?

A) $(D^2 - 1)$

D) $(D^2 + 4)$

D) $(D^2 - 4)$

D) $(D^2 + 1)$ (100% Sure)

Q8: The differential equation ${}^{dy}\!/_{dx} - y = y^3$

A) Bernoulli's (page55) (100% Sure)

A) Homogeneous

A) Cauchy

D) Bessel

Q9: The integrating factor for the first order linear differntial equation: ${}^{dy}\!/_{dx} + y\cot x = \sin^2 x$ is _____.

C) sinx (100% Sure)

D) cosx

D) $e^{\sin x}$

D) $e^{\cos x}$

Q10: In exponential model for the population growth: $P(t) = P_0 e^{kt}$ If $k>0$, then $\lim t \to \infty$ P(t) =

A) 0

B) 1

B) ∞ (page97) (100% Sure)

B) - ∞

Q11: The hook's law states that the force F is proportional to the _____.

A) Length

B) Elongation (page197) (100% Sure)

C) Weight

D) None of these

Q12: Separable form of the differential equation: $^{dy}/_{dx}$ = y - 1 is _____, where v = y - 1.

A) $^{dx}/_{x}$ = dv

B) dx = vdv

C) $^{dy}/_{v}$ = dx (page17) (100% Sure)

D) $^{dv}/_{v} = {}^{dx}/_{x}$

Q13: For f(x,y) = $^{2x}/_{3y}$ + 7, f(tx, ty) = - - -

A) f (x, y)

B) t f(x, y) (page26) (100% Sure)

C) t^2 f(x,y)

D) t^3 f(x,y)

Q14: Which of the following is an equivalent form of the exact differential equation: ydx + xdy = 0?

A) d $^{x}/_{y}$ = 0

B) d $^{y}/_{x}$ = 0 (page33) (100% Sure)

C) d (xy) = 0

D) d (x + y) = 0

Q15: In the general solution of a separable differential equation is $\sin^{-1}y = \cos^{-1}x + c$, provided that y ($^{1}/_{\sqrt{2}}$) = $^{1}/_{\sqrt{2}}$, then c = - - - .

A) $^{\Pi}/_{2}$

B) $\Pi/4$

C) $-\Pi/2$

D) 0 (Confirm Solved) (100% Sure)

Q16: The differential equation of orthogonal trajectory to the family of curves x - 2y = c is:

A) $dy/dx = -1/2$

B) $dy/dx = 1/2$

C) $dy/dx = 2$

D) $dy/dx = -2$ (Confirm) (100% Sure)

Q17: Classify the following differential equation $e^x \, dy/dx + 2y = 3xy$

A) Separable and not linear

B) Linear and not sparable

C) Both sparable and linear

D) Neither sparable nor linear (Confirm Solved) (100% Sure)

Q18: The periodic time is given by:

A) $w/2\Pi$

B) $2\Pi/w$ (page201) (100% Sure)

C) $2\Pi + w$

D) Π/w

Q19: If $x^2y^3dx + x^3y^2dy = 0$ has the equivalent form as $d(\frac{1}{3} x^3y^3) = 0$, then its solution is _____ .

A) $x^3 + y^3 = c$

B) $x^3 - y^3 = c$

C) $x^3y^3 = c$

D) $x^3/y^3 = c$

Q20: The family of parabolas $y^2 = 4ax$ are solutions of the differential equation: $dy/dx = 2a/y$ for ------- value(s) of a.

A) infinite

B) finite

C) unique

D) no (Confirm) (100% Sure)

Q21: If $y= c_1e^{(-2+\sqrt{6})x} + c_2e^{(-2-\sqrt{6})x}$ is the complementary solution of:

A) Ax + B

D) $Ax^2 + Bx + C$

D) $Ax^3 + Bx^2 + Cx + D$ (Confirm) (100% Sure)

D) $(Ax^2 + Bx)2x^2$

Q22: If initial amount of radioactive isotope is 100g. What will be the amount at the end of 30 days such that K=0.043?

A) 371.415

B) 380.560

B) 363.297 (Confirm Solved) (100% Sure)

B) 360.351

Q23: If 2,3,5 are real roots of a differential equation, then the general solution is _____.

A) $y_c = c_1e^{2x} + c_2e^{3x} + c_3e^{5x}$ (confirm Solved) (100% Sure)

B) $y_c = c_1e^{2x} + c_2e^{-3x} + c_3e^{5x}$

B) $y_c = c_1e^{2x} + c_1e^{-3x} + c_1e^{5x}$

B) $y_c = (c_{1+c2+c3)}e^{3x} + e^{2x}$

Q24: Wronskian W(x,2x) = _____.

- **0 (Confirm Solved) (100% Sure)**
- **1**
- **-1**
- **None of these**

Q25: Which of the following is the implicit solution of the differential equation: $^{dy}/_{dx} = -\,^{x}/_{y}$,

A) x + y + 4 =0

B) $x^2 + y^2 - 4 = 0$ (page16) (100% Sure)

B) $x^2 - y^2 + 4 = 0$

B) $x^2 - y^2 - 4 = 0$

Q26: ydx - y(sinx)dy = 0, is an example of _____ differential equation.

A) Exact (page33) (100% Sure)

B) Non-exact

B) Non-linear

B) Non-homogeneous

Q27: Which of the following is an example of ordinary differential equation?

A) (y - x)dx + 4xdy = 0 (page15) (100% Sure)

B) $\partial u / \partial y = - \partial u / \partial x$

B) $ax^2 + bx + c = 0, a \neq 0$

B) $\phi(x) = f(x) + \lambda \int k(x,t)\, \phi(t)dt$

Q28: A differential equation M(x,y)dx + N(x,y)dy = 0 is exact if there exists a multi-variable function f(x,y) such that _____.

A) $df(x,y) = \partial f / \partial x\, dx + \partial f / \partial y\, dy$ (100% Sure)

B) $\int f(x,y)dx = \int \partial f / \partial x\, dx + \int \partial f / \partial y\, dy$

B) $f(x,y) = \partial f / \partial x\, dx + \partial f / \partial y\, dy$

B) $f(x,y) = \int \partial f / \partial x\, dx + \int \partial f / \partial y\, dy$

Q29: Which of the following is an initial value problem (IVP)?

A) $d^2y / dx^2 + y = 0$

B) $d^2y / dx^2 + y = 0, x \in |-2, 2|$

B) $d^2y / dx^2 + y = 0, y(1) = -2$ and $y'(1) = -2$ (Confirm Solved) (100% Sure)

B) $d^2y / dx^2 + y = 0, y(1) = -2$ and $y'(\Pi / 2) = -2$

Q30: Which of the following would be a constant solution of the separable differential equation: $dy / dx = e^{x+y}$?

A) y = 0 (Confirm Solved) (100% Sure)

B) y = 1

B) $y = a \in R$

B) No constant solution exist

Q31: The family of curve $x^2 + y^2 = C^2$ represents a family of circles centered at _____.

A) (1, 0)

D) (0, 1)

D) (0, 0) (page84) (100% Sure)

D) (1, 1)

Q32: The differential equation: $(x + 2y^3)\ {}^{dy}/_{dx} = y$ is linear in unknown:

A) variable y

B) multi- variable x and y

B) variable x (100% Sure)

B) $ {}^{dy}/_{dx}$

Q33: For a system in simple harmonic motion which of the following is the time required to complete a cycle of motion?

A) Frequency

B) Amplitude

B) Period (page201) (100% Sure)

B) Revolution

Q34: Suppose that y_1, y_2 ..... y_n are n solution of the homogeneous nth order differential equation. Then the solution is linearly dependent on an interval if and only if _____ .

A) $W(y_1, y_2, ... ,y_n) = 0$ (page120) (100% Sure)

B) $W(y_1, y_2, ... ,y_n) = \infty$

C) $W(y_1, y_2, ... ,y_n) \neq 0$

D) $W(y_1, y_2, ... ,y_n) = -\infty$

Q35: If we substitute $u = {}^{y}/_{x}$ is differential equation.

A) $ue^u\ du = dx$

B) $ue^{(-u)}\ du = dx$ (page61) (100% Sure)

C) $ue^u\ du = dy$

D) $ue^{(-u)}\ du = dy$

Q36: Which of the following would be a particular solution of the differential equation: $ {}^{dy}/_{dx} = 4$?

A) $y = 4x + a$

B) $y = ax + 4$

B) $y = ax + a$

B) y = 4x + 4 (Solved Confirm) (100% Sure)

Q37: A set of functions $\{f_1(x), f_2(x), f_3(x), \ldots\ldots, f_n(x)\}$ is said to be _____ on an interval I if there exist constants.

A) Linear dependent (page111) (100% Sure)

B) Linear independent

Q38: Separable form f(y)dy + g(x)dx = 0, of the differential equation x sinydx + $(x^2 + 1)$ cosydy = 0 is _____.

A) tanydy + $\frac{x}{x^2+1}$ dx = 0

B) cotydy + $\frac{x}{x^2+1}$ dx = 0 (Solved Confirm) (100% Sure)

B) tanydy + $\frac{x}{x^2-1}$ dx = 0

B) cotydy + $\frac{x}{x^2-1}$ dx = 0

Q39: The differential equation is (1 + lnxy)dx + (1 + $\frac{x}{y}$) dy = 0 is exact because _____.

A) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} = \frac{1}{x}$

B) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y} = \frac{1}{y}$

B) $\frac{\partial M}{\partial y} = \frac{\partial N}{\partial x} = \frac{1}{y}$ (Confirm Solved) (100% Sure)

B) $\frac{\partial M}{\partial x} = \frac{\partial N}{\partial y} = \frac{1}{x}$

Q40: We can derive a differential equation governing the motion of a mass attached to spring when the Newton's second law combined with _____.

A) Hook's law (page197) (100% Sure)

B) Newton's 3rd law