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(Pages : 5)

Name

Reg. No.

FIRST SEMESTER P.G. DEGREE EXAMINATION, NOVEMBER 2021
(CCSS)

Economics

ECO 1C 03—MATHEMATICS FOR ECONOMICS

(2019 Admissions)

Time : Three Hours

Maximum : 80 Marks

Part A (Multiple Choice Questions)

Answer **all** questions.

Each question carries 1 mark.

1. An inverse function of exponential function is called :
 - a) Logarithmic function.
 - b) Quadratic function.
 - c) Linear function.
 - d) None of these.
2. The process of obtaining the derivatives is called :
 - a) Mapping.
 - b) Integration.
 - c) Differentiation.
 - d) None of these.
3. $\begin{vmatrix} a & 0 \\ b & -a \end{vmatrix}$ is :
 - a) ab .
 - b) 0.
 - c) $-a$.
 - d) b .
4. If $MR = 24 - 6Q - Q^2$, TR is _____.
 - a) $24 - 6Q^3 - 4Q$.
 - b) $24Q - 3Q^2 - \frac{1}{3}Q^3$.
 - c) $24Q^2 - 6Q$.
 - d) $24 - 6Q$.

Turn over

1098

2

$$5. \lim_{x \rightarrow 0} \frac{x}{x^2}$$

a) 1

c) -1

b) 0

d) -1

$$6. \text{ If } x^2 + 2xy + y^2, \text{ then } \frac{dy}{dx} \text{ is}$$

a) $\frac{x+y}{y-x}$

c) $\frac{x+1}{y}$

b) $2x + 2y$

d) $-x$

$$7. x^2 + y^2 = 16 \text{ is a function of:}$$

a) Periodic.

c) Explicit.

b) Implicit.

d) Monotone.

$$8. \text{ Find the first term of an AP whose 8th and 12th terms are 39 and 59 respectively:}$$

a) 5.

c) 4.

b) 6.

d) 7.

$$9. \text{ The derivative of } f(x) = \left(1 + x^4 - \frac{1}{x}\right)^{5/8} :$$

a) $\frac{20}{3}x^{17/8} + \frac{5}{3x^{8/3}}$

c) $\frac{5}{3}\left(1 + x^4 + \frac{1}{x}\right)^{2/3}\left(4x^3 + \frac{1}{x^2}\right)$

b) $\frac{5}{3}\left(1 + x^4 + \frac{1}{x}\right)^{2/3}$

d) $\frac{5}{3}(x)^{2/3}\left(4x^3 + \frac{1}{x^2}\right)$

- 10 The values of the future net incomes discounted by the cost of capital are called
- Average capital cost
 - Discounted capital cost
 - Net capital cost
 - Net present value

(10 × 1 = 10 marks)

Part B (Very Short Answer Questions)*Answer any five questions**Each question carries 2 marks**Answer in one or two sentences*

- 11 Check whether the following is a function with proper reasoning

$$y = -2x^2 + 12x + 30$$

- 12 Evaluate $\int_1^3 (x^3 + x + 6) dx$.

- 13 Find $\frac{dy}{dx}$ if $y = (x^3 + 3) + (2x^2 + 3x^3)$.

- 14 Find the product matrix AB where, $A = \begin{bmatrix} 2 & 4 \\ 6 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 8 & 6 \\ 3 & 2 \end{bmatrix}$.

- 15 Find the compound interest for Rs. 18,000 at 14 % per annum for 6 years.

- 16 Find the rank of matrix $A = \begin{bmatrix} -4 & 0 & 5 \\ 1 & 2 & 3 \end{bmatrix}$.

17 Find $\lim_{x \rightarrow 2} \frac{x^5 - 22}{x^2 - 2}$

- 18 Solve the following quadratic equation $5x^2 + 23x + 12 = 0$.

(5 × 2 = 10 marks)

Turn over

Part C (Short Answer Questions)

Answer only **eight** questions

Each question carries **5** marks

- 19 Explain the important properties of determinants
- 20 Evaluate $\int 4x \sqrt{x^2 + 8} \, dx$
- 21 Solve the following differential equation and check the answer using $t = 0$ and $t = 1$.
 $2Y_1 + \dots + 4Y_4 = 114 - 0, Y_0 = 22$
- 22 By using logarithm, differentiate $y = \sqrt{\frac{(x-3)(x^2+4)}{3x^2+4x+5}}$ with respect to x .
- 23 Compute adjoint for the following matrix $A = \begin{bmatrix} 1 & 1 & -3 \\ 2 & 5 & 1 \\ 1 & 3 & 2 \end{bmatrix}$.
- 24 Minimize cost of a firm with cost function $c = 10x^2 + 4xy + 6y^2 + 1600$ subject to production quota $x + y = 78$.
- 25 Given the demand function $P_d = 226 - 2Q^2$ and the supply function $P_s = (2Q + 2)^2$ under pure competition. Find consumer's surplus and producer's surplus.
- 26 A producer has the possibility of discriminating between the domestic and foreign markets for a product where the demands respectively are

$$Q_1 = 42 - 0.2P_1$$

$$Q_2 = 100 - 0.8P_2$$

Total cost = $4000 + 20Q$ where $Q = Q_1 + Q_2$. What price will the producers charge in order to maximize profit (a) With discrimination between markets ; and (b) Without discrimination

27. Given $Q_d = 43 - 0.4P$ and $Q_s = -5 + 0.1P$. Calculate the market price P , the time t and the equilibrium price P_e .

28. Explain the uses of integration in economics.

29. $z = x^2 + 2hxy + h^2y^2$. Show that $\frac{\partial^2 z}{\partial x^2} = \frac{\partial^2 z}{\partial y^2}$.

30. Find the maxima and minima values if any for the function

$$v = x^3 + 5x^2 + 8x + 5.$$

(8 × 5 = 40 marks)

Part D

Answer only **two** questions.
Each question carries 10 marks.

31. Solve the equations by using Cramer's rule

$$2x - 3y + 4z = 5$$

$$x + 2y - 3z = 8$$

$$x - y - z = 1.$$

32. Explain various rules of differentiation with examples.

33. Using matrix inverse method, solve for x , y and z

$$2x_1 + 4x_2 - x_3 = 15$$

$$x_1 - 3x_2 + 2x_3 = -5$$

$$6x_1 + 5x_2 + x_3 = 28.$$

34. Optimize $z = 8x^2 + 4xy + 12y^2$ subject to $x + y = 146$

(2 × 10 = 20 marks)