INDIAN SCHOOL MUSCAT

SECOND PERIODIC TEST

MATHEMATICS – 041

CLASS: XII MAX. MARKS: 20

DATE: 09-05-2021 TIME ALLOWED: 40 MINUTES

INSTRUCTIONS:

1. All questions are compulsory.
2. Calculators are not allowed.
3. Question No 1 to 2 are Very short answer Type questions of 1 mark each.
4. Question No 3 to 6 are Short answer type – I questions of 2 marks each.
5. Question No 7 to 8 are Short answer type- II questions of 3 marks each.
6. Question No. 9 is on case study. The case study question has 5 case – based sub-parts. An examinee is to attempt any 4 out of 5 sub – parts (1 Mark each).

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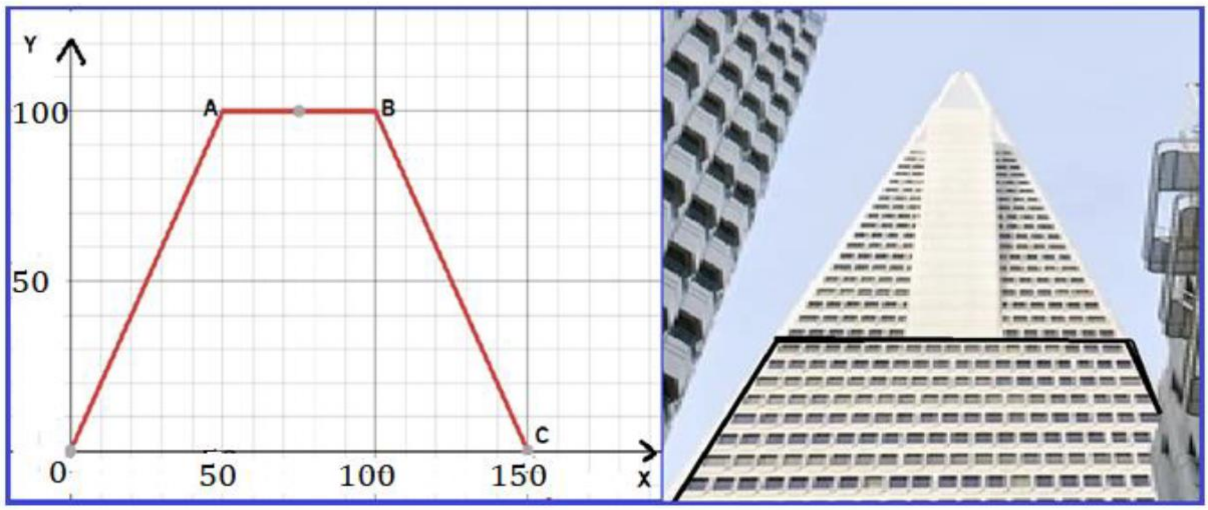
Q.No		Marks
1.	Find $\frac{dy}{dx}$ if y = cos $(\sqrt{3^x})$	**1**
2.	If y = log $(sec^2 x)$, find $\frac{dy}{dx}$	**1**
3.	Find the left hand derivative of the following function $f(x) = \begin{cases} x[x], & 0 \le x < 2 \\ x(x-1), & 2 \le x < 3 \end{cases}$ at x = 2 Using the above result what do you conclude about the differentiability of the function at x = 2?	**2**
4.	If x = t^2 and y = $t - t^3$, find $\frac{d^2y}{dx^2}$ at t = 1	**2**
5.	Differentiate w.r.t. x : $tan^{-1}\left(\frac{2\sqrt{x}}{1-x}\right)$	**2**
6.	If y = $sin^{-1}\sqrt{3-x^2}$ and u = $\sqrt{3-x^2}$ find $\frac{dy}{du}$	**2**
7.	If $x^p y^q = (x+y)^{p+q}$, *prove that* $\frac{dy}{dx} = \frac{y}{x}$ *and* $\frac{d^2y}{dx^2} = 0$	**3**
8.	If $y = e^x(\sin x + \cos x)$, *prove that* $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$	**3**

9. **Case study-based questions are compulsory. Attempt any four sub parts of each question. Each sub part carries 1 mark.**

The Transamerica Pyramid, shown below, is an office building in San Francisco. It stands 853 feet tall and is 145 feet wide at its base. Imagine that a coordinate plane is placed over a side of the building. The graph on the left in the image below represents a cross section of the tower (graph is not proportional to actual height and width) and is defined by the function, $f(x) = -|x - 50| - |x - 100| + 150$, where x axis represents the width and y axis represents the height.



Based on the above information, answer any four of the following questions:

(i) Which among the following is the correct statement? 1

(A) $f(x)$ is discontinuous at $x = 50$ and $x = 100$.

(B) $f(x)$ is continuous at only $x = 50$ and $x = 100$.

(C) $f(x)$ is continuous at all points in its domain.

(D) $f(x)$ is discontinuous at all points in its domain.

(ii) Find $f'(x)$ when $x \in (50,100)$ 1

(A) 5 (B) 0 (C) -1 (D) 10

(iii) Which statement among the following is correct? 1

(A) $f(x)$ is differentiable everywhere. (B) $f(x)$ is not differentiable in $(0,50)$

(C) $f(x)$ is not differentiable in $(50,100)$ (D) $f(x)$ is not differentiable at $x = 50$ and $x = 100$

(iv) Find $\frac{dy}{dx}$ when $x = 120$ 1

(A) -2 (B) 2 (C) 0 (D) 80

(v) Find $\frac{d^2y}{dx^2}$ when $x = 40$ 1

(A) -2 (B) 2 (C) 0 (D) 40