



# UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / First Semester – Spring 2022

Paper: Mathematics A-I [Calculus(I)]

Course Code: MATH-101

Roll No. ....

Time: 3 Hrs.

Marks: 60

## THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1. Solve the following:

(6x5=30)

(i)	Does the limit of $f(x) = \frac{ x }{x}$ exist at $x = 0$	(5)
(ii)	Show that $f(x) = \begin{cases} x^2 \sin \frac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}$ Is differentiable at $x = 0$ and find $f'(0)$	(5)
(iii)	Solve the inequality $\frac{6-x}{4} < \frac{3x-4}{2}$	(5)
(iv)	Find the function $f(x)$ whose derivative is $\sin x$ and whose graph passes through the point $(0, 2)$ .	(5)
(v)	Find $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\sec x}{1 + \tan x}$	(5)
(vi)	Find $\frac{dy}{dx}$ if $y = \int_x^5 3t \sin t dt$	(5)

Solve the following:

(5x6=30)

Q.2	Draw the graph of $\sin x$ . Using the properties of scaling and shifting draw the graph of $y = 1 + \sin(x + \frac{\pi}{4})$ .	(6)
Q.3	Evaluate $\left(\frac{-2+i\sqrt{3}}{\sqrt{5}-6i}\right)^3$	(6)
Q.4	For what value or values of constant $m$ , if any, is	(6)
	$f(x) = \begin{cases} \sin 2x, & x \leq 0 \\ mx, & x > 0 \end{cases}$ a) Continuous at $x = 0$ ?    b) Differentiable at $x = 0$ ?	
Q.5	Find absolute maximum and minimum values of $f(x) = x^{\frac{2}{3}}$ on the interval $[-2, 3]$ .	(6)
Q.6	Find the area of the region bounded by x-axis and the graph of $f(x) = x^3 - x^2 - 2x, \quad -1 \leq x \leq 2$	(6)