



# UNIVERSITY OF THE PUNJAB

**B.S. 4 Years Program : First Semester – 2020**

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

Course Code: MATH-101 / MATH 11010Part – I (Compulsory) Time: 30Min. Marks: 10

Roll No. in Fig. ....

Roll No. in Words. ....

**Attempt this Paper on this Question Sheet only.**

**Division of marks is given in front of each question.**

**This Paper will be collected back after expiry of time limit mentioned above.**

Signature of Supdt.:

**Q.1. Encircle the right answer cutting and overwriting is not allowed. (10x1=10)**

(i)	Maclaurin series is centered at ____ (a) 0                      (b) x                      (c) -1                      (d) 1
(ii)	Every polynomial function is (a) differentiable      (b) continuous      (c) piece-wise continuous      (d) both (a) & (b)
(iii)	For what value of x, the inequality $-2x + 4 > 15x + 10$ is satisfied (a) 0                      (b) 1                      (c) 2                      (d) none of these
(iv)	Differentiation of a function implies _____. (a) existence of limit      (b) integrality      (c) continuity                      (d) all a,b and c
(v)	If z is a complex number, then $\bar{z}z$ is (a) real                      (b) complex                      (c) zero                      (d) prime

(vi)	The function $y =  x - 5 $ is not differentiable at (a) (-5,0)                      (b) (0,5)                      (c) 5                      (d) none of these
(vii)	Domain of $\sqrt{2x - 4}$ is (a) $x \leq -2$ (b) $-2 \leq x$ (c) $x \leq -4$ (d) none of these
(viii)	What is the magnitude of the complex number $-1 - i\sqrt{3}$ (a) 2                      (b) -2                      (c) 0                      (d) none of these
(ix)	$\int \sin^2 x \, dx = ?$ (a) $-\cos^2 x + c$ (b) $\frac{1}{2}x - \frac{1}{4}\sin 2x + c$ (c) $\cos^2 x + c$ (d) $\frac{1}{2}x + \frac{1}{4}\sin 2x + c$
(x)	$(\sqrt{3} + i)^3$ is equal to (a) $3\sqrt{3}$ (b) $8i$ (c) $-8i$ (d) none of these



**ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED**

Q.2. Solve the following:

(5x4=20)

(i)	Evaluate $\lim_{x \rightarrow 0} \frac{\frac{1}{x-1} + \frac{1}{x+1}}{x}$	(4)
(ii)	Evaluate $\int \sqrt{x} \cos^2(x^{\frac{3}{2}}) dx$ .	(4)
(iii)	Find $dy/dx$ from $\sqrt{xy} = 1$ .	(4)
(iv)	Evaluate $\int_{-1}^{+1} \frac{5x}{(4+x^2)^2} dx$ . Does this integral converge or diverge?	(4)
(v)	Graph the function $y = \frac{1}{x-3} + 2$ .	(4)

Q.3. Solve the following:

(5x6=30)

(i)	Evaluate the integral: $\int (5x^2 e^{4x^3} + \frac{\ln x}{x}) dx$	(6)
(ii)	Solve the inequality $\frac{1}{x+2} < \frac{2}{x-3}$ and represent its solution set on the number line.	(6)
(iii)	Evaluate $\lim_{x \rightarrow 0} \frac{x \cot(4x)}{\sin^2 x \cot^2(2x)}$	(6)
(iv)	What is the volume of solid of revolution generated in each case: a) The portion of the curve $y = x^2$ from $x=1$ to $x=2$ is revolved around $x$ -axis. b) The region bounded by $x = y^2 + 3$ and $x = 4y$ is revolved around $y$ -axis.	(3+3)
(v)	Show that the function $r(\theta) = \tan\theta - \cot\theta - \theta$ , have exactly one zero in the interval $(0, \frac{\pi}{2})$ .	(6)