Sethu Bhaskara MHSS
HALF YEARLY EXAMS'19
11 STD
MATHEMATICS

PART – I

1) c) 1	11) d) A – AT
2) c) n	12) b) 15/4
3) c) [0, 1)	13) d) Coplanar Vrs
4) c) –8, 8	14) c) $\sqrt{2}$
5) c) 3	15) a) ½
6) a) 0	16) c) $(\log 3)3^x + 3x^2$
7) a) $b^2 - 1$ iff $b \le \sqrt{2}$	17) b) 2
8) d) 4/15	18) d) does not exist
9) c) 12/5	19) c) $\pi/4$
10) c) 9/16	20) a) 2

PART – II

21) $f(-2) = -16$; $f(2) = 16$, $B = [-16, 16]$ — 2

22) $f(-3) = 1$ — 1
$f(0) = -3$ — 1

23) $(2+x)^{-4} = 2^{-4}\left(1+\frac{x}{2}\right)^{-4}$ — 1
$= \frac{1}{16}\left(1 - 2x + 10x^2 - 20x^3 + \dots\right)$
(OR)
$= \frac{1}{16} - \frac{x}{8} + \frac{5x^2}{8} - \frac{5x^3}{4}$ — 1

24) Combained Eqn is
$2x^2 - 3xy - 2y^2 = 0$ — 1½
It is ⊥r — ½

25) $\begin{vmatrix} b-1 & 2 & 3 \\ 3 & 1 & 2 \\ 1 & -2 & 4 \end{vmatrix} = 0$ — 1
$\Rightarrow b = 49/8$ — 1

26) $A - B + C$ — ½
$= \begin{bmatrix} \sec^2\theta - \tan^2\theta + 0 & \sin^2\theta + \cos^2\theta - 1 \\ \cot^2\theta - \csc^2\theta + 1 & 0 + 1 + 0 \end{bmatrix}$ — 1
$= \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ — ½

27) Let $x = \sin\theta \Rightarrow \theta = \sin^{-1}x$ — ½
$y = \sin^{-1}(\sin 3\theta) = 3\theta$ — 1
$dy/dx = \frac{3}{\sqrt{1-x^2}}$ — ½

28) $\lim_{x\to\infty} \frac{\left(x(1+2/x)\right)^x}{\left(x(1-2/x)\right)^x} = \frac{e^2}{e^{-2}}$ — 1½
$= e^4$ — ½

29) $f(-1) = 0$
$f(1) = 0$ — (2)
$\Rightarrow f$ is conti on $[-1, 1]$

30) $f(x) = \begin{cases} x-3, & x \ge 3 \\ -x+3, & x < 3 \end{cases}$ — 1
$f'(2) = -1$, $f'(4) = 1$ — 1

PART – III

31) $2x^2 - 1 = 17 \Rightarrow x = \pm 3$ — 1
$2x^2 - 1 = 4 \Rightarrow x = \pm\sqrt{5/2}$ — 1
$2x^2 - 1 = -2 \Rightarrow$ No pre Images — 1

32) $1 - 2\sin x \ne 0$ — 1
Domain $R - \{n\pi + (-1)^n \pi/6\}$, $n \in Z$ — 2

33) $nC_r = \frac{nP_r}{r!}$ — 1
$120 = \frac{720}{r!} \Rightarrow r = 3$ — 1
$\Rightarrow n = 10$ — 1

34) $a_k = a + (k-1)d$
$a_{k-1} = a + (k-2)d$
$a_{k+1} = a + kd$ — 2
$\frac{a_{k-1} + a_{k+1}}{2} = a_k$ — 1

35) $x\cos 150 + y\sin 150 = 12$ — 1½
$\sqrt{3}x - y + 24 = 0$ — 1½

36) $\vec{a}\times\vec{b} = 5\hat{i} - 3\hat{j} + \hat{k}$ — 1
$|\vec{a}\times\vec{b}| = \sqrt{35}$ — 1
$\therefore \pm 10\sqrt{3}\hat{n} = \pm \frac{10\sqrt{3}}{\sqrt{35}}(5\hat{i} - 3\hat{j} + \hat{k})$ — 1

37) $f(0^+) = 1$ — 1
$f(0^-) = -1$ — 1
$\Rightarrow$ Limit doesn't exist — 1
(or
$f(0^+) \neq f(0^-)$)

38) $y' = 4\sin^3 x\cos x + 4\cos^3 x(-\sin x)$ — 3

39) mRm ⇒ It is Reflexive — 1
mRn = nRm ⇒ It is symmetric — 1
mRn and nRp ⇒ mRp — 1
⇒ It is transitive
R is EQUIVALANCE

40) $\sqrt{3}\sin x + \cos x = 2$ — ½
$\div$ by 2 ⇒ $\frac{\sqrt{3}}{2}\sin x + \frac{1}{2}\cos x = 1$ — 1
$\cos(x - 60°) = 1$ — 1
$\Rightarrow x = 2n\pi + \pi/3$ — ½

PART–IV

41) a) $|x| = \begin{cases} -x & \text{if } x \le 0 \\ x & \text{if } x > 0 \end{cases}$ — 1

$f(x) = \begin{cases} 3x & \text{if } x \le 0 \\ x & \text{if } x > 0 \end{cases}$ — 1

$g(x) = \begin{cases} x & \text{if } x \le 0 \\ 3x & \text{if } x > 0 \end{cases}$ — 1

For $x \le 0$ $f\circ g = 3x$ — 1
For $x > 0$ $f\circ g = 3x$ — 1

b) let $x^2 - 4 = 0 \Rightarrow x = \pm 2$ — 2
$(-\infty, -2)$; $(-2, 2)$; $(2, \infty)$ — 3

42) a) $(\sin 2A + \sin 2B) + \sin 2C$
$= 2\sin(A+B)\cos(A-B) + \sin 2C$ — 1
$= 2\sin(\pi/2 - C)\cos(A-B) + 2\sin C\cos C$ — 1
$= 2\cos C(\cos(A-B) + \sin C)$ — 1
$= 2\cos C(\cos(A-B) + \sin(\pi/2 - (A+B)))$ — 1
$= 2\cos C(2\cos A\cos B)$ — 1
$= 4\cos A\cos B\cos C$

b) $\frac{b-c}{a}\cos A/2$
$= \frac{2R\sin B - 2R\sin C}{2R\sin A}\cos A/2$ — 2
$= \frac{\sin B - \sin C}{\sin A}\cos A/2$ — 1
$= \frac{2\sin\left(\frac{B-C}{2}\right)\cos\left(\frac{B+C}{2}\right)}{2\sin A/2\cos A/2}\cos A/2$ — 1
$= \sin\left(\frac{B-C}{2}\right)$ — 1

43) a) let P(n) Given — 1
P(1) is true — 1
P(k) is true — 1
To Prove P(k+1) is true — 1
By Math. Indu. P(n) is true — 1

b) $h^2 - ab = 4 - 4 = 0$ — 2
It is pair of ||el lines — 1
$d = 2\sqrt{\frac{g^2 - ac}{a(a+b)}} = \sqrt{5}$ Units — 2

44) a) $\Delta = \begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix}$ — 1

Put $a = b \Rightarrow \Delta = 0$
$\Rightarrow (a-b)$ is factor — 2
|||ly $(b-c)$, $(c-a)$ also factors
$\Delta = k(a-b)(b-c)(c-a)(a+b+c)$ — ½
$k = 1$ — ½
$\Delta = (a-b)(b-c)(c-a)(a+b+c)$ — 1

b) Diagram — 1

$\overrightarrow{OG_1} = \frac{\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC}}{2}$ — 2

|||ly $\overrightarrow{OG_2} = \overrightarrow{OG_3} = \frac{\overrightarrow{OA} + \overrightarrow{OB} + \overrightarrow{OC}}{2}$ — 1

∴ Medians of a △le are concurrent — 1

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45) a)

$f(x) = \frac{(x-1)(x^2+x+1)}{x-1}$ — 1

$= x^2+x+1$ — 1

$f(1) = 3$ — 1

$f(1^-) = 3$ — 1

$f(1^+) = 3$ — 1

$\Rightarrow f$ is continuous — 1

b) $y' = \frac{e^{\tan^{-1}x}}{1+x^2}$ — 2

$(1+x^2)\,y' = y$ — 1

$\Rightarrow (1+x^2)y'' + (2x-1)y = 0$ — 2

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46) a) $x\left(1+\frac{25}{x^2}\right)^{1/2} - x\left(1+\frac{9}{x^2}\right)^{1/2}$ — 2

$= x\left[1+\frac{1}{2}\left(\frac{25}{x^2}\right)+\cdots - 1 - \frac{9}{x^2}\cdot\frac{1}{2}\right]$ — 2

$= 8/x$ — 1

b) $\lim_{x\to 0} \frac{\sqrt{1+x^2}-x}{x} = \frac{1}{0} = \infty$ — 5

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47) a) $\cos\theta = \frac{\vec{a}\cdot\vec{b}}{|\vec{a}|\,|\vec{b}|}$ — 1/2

$\sin\theta = \frac{|\vec{a}\times\vec{b}|}{|\vec{a}|\,|\vec{b}|}$ — 1 1/2

$\vec{a}\cdot\vec{b} = 12$ — 1

$|\vec{a}\times\vec{b}| = 8\sqrt{3}$ — 1

$|\vec{a}| = \sqrt{14}$; $|\vec{b}| = \sqrt{24}$ — 1

$\theta = \cos^{-1}(\sqrt{3}/\sqrt{7})$; $\theta = \sin^{-1}(2/\sqrt{7})$ — 1

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b) $\frac{du}{dx} = \cos(ax^2+bx+c)\,(2ax+b)$ — 2

$\frac{dv}{dx} = -\sin(lx^2+mx+n)\,(2lx+m)$ — 2

$\frac{du/dx}{dv/dx} = \frac{du}{dv}$

$= \frac{-\cos(ax^2+bx+c)\,(2ax+b)}{\sin(lx^2+mx+n)\,(2lx+m)}$ — 1

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