


ADVANCED PATTERN PART TEST-5(APT-5)

TARGET : JEE (MAIN+ADVANCED) 2018

SUBJECT : MATHEMATICS
COURSE : VIJAY (01JR)
Date : 11-02-2018
Time: 2 Hours
Maximum Marks : 160

Please read the instructions carefully. You are allotted 5 minutes specifically for this purpose.

GENERAL :

- The sealed booklet is your Question Paper. Do not break the seal till you are instructed to do so.
- The question paper CODE is printed on the right hand top corner of this sheet.
- Use the Optical Response Sheet (ORS) provided separately for answering the question.
- Blank spaces are provided within this booklet for rough work.
- Write your Name and Roll Number in the space provided on the below cover.
- After the open booklet, verify that the booklet contains all the **40** questions along with the options are legible.

QUESTION PAPER FORMAT AND MARKING SCHEME :

- This questions paper consists of **Two** sections.
- Each section as detailed in the following table :

Section	Question Type	Number of Questions	Category-wise Marks for Each Question				Maximum Marks of the Section
			Full Marks	Partial Marks	Zero Marks	Negative Marks	
1	One or More Correct Option(s)	20	+4 If only the bubble(s) corresponding to all the correct option(s) is(are) darkened	+1 For darkening a bubble corresponding to each correct option, provided NO incorrect option is darkened	0 If none of the bubbles is darkened	-2 In all other cases	80
2	Comprehension (One or More Correct Option(s))	20	+4 If only the bubble(s) corresponding to all the correct option(s) is(are) darkened	—	0 If none of the bubbles is darkened	-2 In all other cases	80

OPTICAL RESPONSE SHEET :

- Darken the appropriate bubbles on the original by applying sufficient pressure.
- The original is machine-gradable and will be collected by the invigilator at the end of the examination.
- Do not tamper with or mutilate the ORS.
- Write your name, roll number and the name of the examination centre and sign with pen in the space provided for this purpose on the original. **Do not write any of these details anywhere else.** Darken the appropriate bubble under each digit of your roll number.

DARKENING THE BUBBLES ON THE ORS :

- Use a **BLACK BALL POINT** to darken the bubbles in the upper sheet.
- Darken the bubble **COMPLETELY**.
- Darken the bubble **ONLY** if you are sure of the answer.
- The correct way of darkening a bubble is as shown here :
- There is **NO** way to erase or "un-darkened bubble.
- The marking scheme given at the beginning of each section gives details of how darkened and **not darkened** bubbles are evaluated.

NAME OF THE CANDIDATE :

ROLL NO. :

 I have read all the instructions
and shall abide by them

 I have verified the identity, name and roll number
of the candidate.

Signature of the Candidate

Signature of the Invigilator

Resonance Eduventures Ltd.
CORPORATE OFFICE : CG Tower, A-46 & 52, IPIA, Near City Mall, Jhalawar Road, Kota (Raj.) - 324005

Ph.No. : +91-744-3012222, 6635555 | **Toll Free :** 1800 258 5555

Reg. Office : J-2, Jawahar Nagar, Main Road, Kota (Raj.) 324005 | **Ph. No.:** +91-744-3192222 | **FAX No. :** +91-022-39167222

Website : www.resonance.ac.in | **E-mail :** contact@resonance.ac.in | **CIN:** U80302RJ2007PLC024029

SECTION – 1: (Maximum Marks : 80)

- Σ This section contains **TWENTY** questions
- Σ Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
- Σ For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS
- Σ For each question, marks will be awarded in one of the following categories :
- Full Marks : +4 If only the bubble(s) corresponding to all the correct option(s) is(are) darkened.
- Partial Marks : +1 For darkening a bubble corresponding to **each correct option**, provided NO incorrect option is darkened.
- Zero Marks : 0 If none of the bubbles is darkened.
- Negative Marks : -2 In all other cases.
- Σ For example, if (A), (C) and (D) are all the correct options for a question, darkening all these three will result in +4 marks ; darkening only (A) and (D) will result in +2 marks and darkening (A) and (B) will result in -2 marks, as a wrong option is also darkened.

1. If the lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{\lambda}$ and $\frac{x-1}{\lambda} = \frac{y-4}{2} = \frac{z-5}{1}$ intersect at a point (α, β, γ) , then

(A) $\lambda = -1$

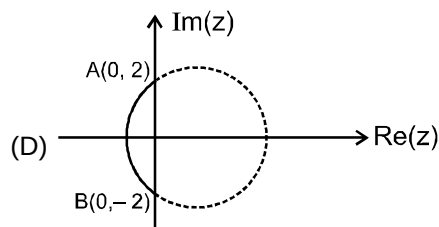
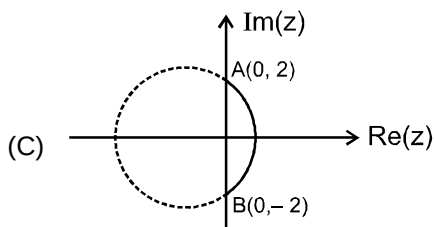
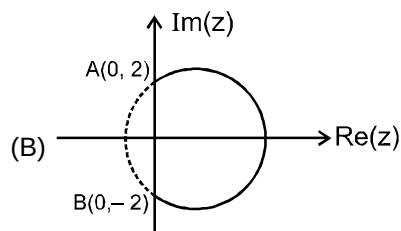
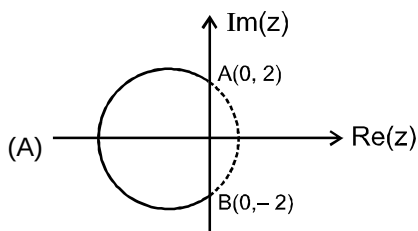
(B) $\lambda = 2$

(C) $\lambda = -3$

(D) $\lambda = 0$

Space for Rough Work

2. If $\arg \left(\frac{z-2i}{z+2i} \right) = \frac{\pi}{6}$, then which of the following option(s) gives the correct locus of z ?



3. Let ΔPQR be a triangle. Let $\vec{a} = \overrightarrow{QR}$, $\vec{b} = \overrightarrow{RP}$ and $\vec{c} = \overrightarrow{PQ}$. If $|\vec{a}| = 12$, $|\vec{b}| = 4\sqrt{3}$ and $\vec{b} \cdot \vec{c} = 24$, then which of the following is(are) true?

(A) $\frac{|\vec{c}|^2}{2} - |\vec{a}| = 12$

(B) $\frac{|\vec{c}|^2}{2} + |\vec{a}| = 30$

(C) $|\vec{a} \times \vec{b} + \vec{c} \times \vec{a}| = 48\sqrt{3}$

(D) $\vec{a} \cdot \vec{b} = -72$

4. If $x^2 + x + 1 = 0$ and $N = \left(x + \frac{1}{x}\right)^2 + \left(x^2 + \frac{1}{x^2}\right)^2 + \left(x^3 + \frac{1}{x^3}\right)^2 + \dots + \left(x^{81} + \frac{1}{x^{81}}\right)^2$ then

(A) Number of divisors of N is 10

(B) Number of prime factors of N is 2

(C) Highest prime factor of N is 3

(D) N is perfect square

Space for Rough Work

5. If $\vec{a} = \hat{i} + \hat{j} + \hat{k}$, $\vec{a} \cdot \vec{b} = 2$ and $\vec{a} \times \vec{b} = 2\hat{i} + \hat{j} - 3\hat{k}$, then
- (A) $\vec{a} + \vec{b} = 5\hat{i} - 4\hat{j} + 2\hat{k}$ (B) $\vec{a} + \vec{b} = 3\hat{i} + 2\hat{k}$
 (C) $\vec{b} = 2\hat{i} - \hat{j} + \hat{k}$ (D) $\vec{b} = \hat{i} - 2\hat{j} - 3\hat{k}$
6. Projection of line $\frac{x+1}{2} = \frac{y+1}{-1} = \frac{z+3}{4}$ on the plane $x + 2y + z = 6$; has equation
- (A) $x + 2y + z - 6 = 0 = 9x - 2y - 5z - 8$ (B) $x + 2y + z + 6 = 0, 9x - 2y + 5z = 4$
 (C) $\frac{x-1}{4} = \frac{y-3}{-7} = \frac{z+1}{10}$ (D) $\frac{x+3}{4} = \frac{y-2}{7} = \frac{z-7}{-10}$
7. If the vertices of an equilateral triangle are situated at $0, z_1, z_2$; then which of the following is/are true (where 0 is the origin)
- (A) $|z_1| = |z_2|$ (B) $|z_1 - z_2| = |z_1|$
 (C) $|z_1 + z_2| = |z_1| + |z_2|$ (D) $|\text{principle arg}(z_1) - \text{principle arg}(z_2)| = \frac{\pi}{3}$
8. Let $\vec{\alpha} = a\hat{i} + b\hat{j} + c\hat{k}, \vec{\beta} = b\hat{i} + c\hat{j} + a\hat{k}$ and $\vec{\gamma} = c\hat{i} + a\hat{j} + b\hat{k}$ be three coplanar vectors with $a \neq b$, and $\vec{v} = \hat{i} + \hat{j} + \hat{k}$. Then $\vec{v}$ is perpendicular to
- (A) $\vec{\alpha} + 2\vec{\beta}$ (B) $\vec{\beta} - 3\vec{\alpha} + 4\vec{\gamma}$
 (C) $\vec{\gamma} + \vec{\beta} - \vec{\alpha}$ (D) $\vec{\beta} - 2\vec{\gamma}$

Space for Rough Work

9. If $|Z_1| = 12$ and $|Z_2 - (5 + 2\sqrt{6}i)| = 3$ be two curves satisfied by two points Z_1 and Z_2 respectively, then which of the following is/are **CORRECT** ?
- (A) maximum value of $|Z_1 - Z_2|$ is 22
 (B) maximum value of $|Z_1 - Z_2|$ is 21
 (C) minimum value of $|Z_1 - Z_2|$ is 2
 (D) maximum of $|Z_1 - Z_2|$ occurs along the line joining centre of two circles.
10. If $\sqrt{5-12i} + \sqrt{-5-12i} = z$ then principle value of $\arg(z)$ can be
- (A) $-\frac{\pi}{4}$ (B) $\frac{\pi}{4}$ (C) $\frac{3\pi}{4}$ (D) $\frac{-3\pi}{4}$
11. If $\vec{x} + \vec{y} = \vec{a}$, $\vec{x} \times \vec{y} = \vec{b}$ and $\vec{x} \cdot \vec{a} = 1$, then
- (A) $\vec{x} = \frac{\vec{a} + \vec{a} \times \vec{b}}{|\vec{a}|^2}$ (B) $\vec{x} = \frac{\vec{a} \times \vec{b} + \vec{b}}{|\vec{a}|^2}$ (C) $\vec{y} = \frac{\vec{a} \times \vec{b} - \vec{a}}{|\vec{a}|^2}$ (D) $\vec{y} = \vec{a} - \frac{\vec{a} \times \vec{b} + \vec{a}}{|\vec{a}|^2}$
12. Let $\vec{a}$, $\vec{c}$ be unit vectors and $|\vec{b}| = 4$ with $\vec{a} \times \vec{b} = 2\vec{a} \times \vec{c}$. The angle between $\vec{a}$ and $\vec{c}$ is $\cos^{-1}\left(\frac{1}{4}\right)$. If $\vec{b} - 2\vec{c} = k\vec{a}$, then k is equal to
- (A) $\frac{1}{3}$ (B) $\frac{1}{4}$ (C) -4 (D) 3

Space for Rough Work

13. The equation $(26x - 1)^2 + (26y - 3)^2 = k(5x - 12y + 1)^2$ will represent a parabola for some value 'k' then
 (A) k is an even number (B) k is a prime number
 (C) unit digit in 7^k is 1 (D) k = 8
14. Given α, β respectively, the fifth and fourth non real roots of unity, then the value of $(1 + \alpha)(1 + \beta)(1 + \alpha^2)(1 + \beta^2)(1 + \alpha^4)(1 + \beta^4)$, is
 (A) 1 (B) 0 (C) 2 (D) 8
15. The volume of a right triangular prism $ABCA_1B_1C_1$ is equal to 3. If the position vectors of the vertices of the base ABC are $A(1, 0, 1)$, $B(2, 0, 0)$ and $C(0, 1, 0)$, then position vectors of the vertex A_1 can be:
 (A) $(2, 2, 2)$ (B) $(0, 2, 0)$ (C) $(0, -2, 2)$ (D) $(0, -2, 0)$
16. Let $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$, $\vec{b} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{c} = \hat{i} + \hat{j} - 2\hat{k}$ be three vectors. A vector in the plane of b and c whose projection on a is of magnitude $\sqrt{2/3}$ is
 (A) $2\hat{i} + 3\hat{j} - 3\hat{k}$ (B) $2\hat{i} + 3\hat{j} + 3\hat{k}$ (C) $-2\hat{i} - \hat{j} + 5\hat{k}$ (D) $2\hat{i} + \hat{j} + 5\hat{k}$

Space for Rough Work

17. If $|Z - 3| = \min \{|Z - 1|, |Z - 5|\}$, then $\text{Re}(z)$ equals to
 (A) 2 (B) $\frac{5}{2}$ (C) $\frac{7}{2}$ (D) 4
18. The locus of the mid point of the focal radii of a variable point moving on the parabola, $y^2 = 4ax$ is a parabola whose
 (A) Latus rectum is half the latus rectum of the original parabola
 (B) Vertex is $(a/2, 0)$
 (C) Directrix is y-axis
 (D) Focus has the co-ordinates $(a, 0)$
19. The vector $\vec{a} = x\hat{i} - 2\hat{j} + 5\hat{k}$ and $\vec{b} = \hat{i} + y\hat{j} - z\hat{k}$ are collinear, if
 (A) $x = 1, y = -2, z = -5$ (B) $x = \frac{1}{2}, y = -4, z = -10$
 (C) $x = \frac{-1}{2}, y = 4, z = 10$ (D) $x = -1, y = 2, z = 5$
20. Let C denote the set of all complex numbers and let us define two sets A and B as
 $A = \left\{ z : z \in \mathbb{C} \text{ and } \text{Arg}(z - i) \geq \frac{\pi}{3} \right\}$, where $\text{Arg}(z)$ represents principal arguments of z.
 $B = \{ z : z \in \mathbb{C} \text{ and } |z - i| \leq 1 \}$
 then identify the correct statement
 (A) $A \cap B$ represents complex numbers lying inside or on boundary of sector of a circle
 (B) set B is a subset of set A
 (C) $A \cap B$ represents complex numbers lying on an arc of a circle
 (D) $A \cap B$ represents all complex numbers lying inside on boundary of segment of a circle

Space for Rough Work

SECTION – 2 : (Maximum Marks : 80)

- Σ This section contains **TEN** paragraphs
 Σ Based on each paragraph, there will be **TWO** questions.
 Σ Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct
 Σ For each question, darken the bubble(s) corresponding to all the correct option(s) in the ORS
 Σ Marking scheme :
 +4 If the bubbles corresponding to the answers are darkened
 0 If none of the bubbles is darkened
 -2 In all other cases

Paragraph for Question Nos. 21 to 22

Consider the lines

$$L_1 : \frac{x+1}{3} = \frac{y+2}{1} = \frac{z+1}{2}$$

$$L_2 : \frac{x-2}{1} = \frac{y+2}{2} = \frac{z-3}{3}$$

21. The unit vector perpendicular to both L_1 and L_2 is

(A) $\frac{-\hat{i} + 7\hat{j} + 7\hat{k}}{\sqrt{99}}$ (B) $\frac{-\hat{i} - 7\hat{j} + 5\hat{k}}{5\sqrt{3}}$ (C) $\frac{-\hat{i} + 7\hat{j} + 5\hat{k}}{5\sqrt{3}}$ (D) $\frac{7\hat{i} - 7\hat{j} - \hat{k}}{\sqrt{99}}$

22. The shortest distance between L_1 and L_2 is

(A) 0 (B) $\frac{17}{\sqrt{3}}$ (C) $\frac{41}{5\sqrt{3}}$ (D) $\frac{17}{5\sqrt{3}}$

Space for Rough Work

Paragraph for Question Nos. 23 to 24

If $Z = x + iy$ and the minimum value of the expression $E = |z|^2 + |z - 3|^2 + |z - 6i|^2$ is m then

23. Value of $2m$ is equal to
 (A) 30 (B) 60 (C) 90 (D) 15
24. Value of x and y is equal to $[Z = x + iy]$
 (A) $x = 2, y = 1$ (B) $x = 3, y = 2$ (C) $x = 1, y = 2$ (D) $x = 5, y = 2$

Paragraph for Question Nos. 25 to 26

A ray of light is coming along the line $L = 0$ and strikes the plane mirror kept along the plane $P = 0$ at B. A $(2, 1, 6)$ is a point on the line $L = 0$ whose image about $P = 0$ is A' . It is given that $L = 0$ is $\frac{x-2}{3} = \frac{y-1}{4} = \frac{z-6}{5}$ and $P = 0$ is $x + y - 2z = 3$.

25. Co-ordinates of A' are
 (A) $(6, 5, 2)$ (B) $(6, 5, -2)$ (C) $(6, -5, -2)$ (D) $(-6, -5, 2)$
26. If $L_1 = 0$ is the reflected ray, then its equation is
 (A) $\frac{x+10}{4} = \frac{y-5}{4} = \frac{z+2}{3}$ (B) $\frac{x+10}{3} = \frac{y+15}{5} = \frac{z+14}{5}$
 (C) $\frac{x+10}{4} = \frac{y+15}{5} = \frac{z+14}{3}$ (D) none of these

Space for Rough Work

Paragraph for Question Nos. 27 to 28

Let $\vec{a} = \hat{i} + 2\hat{j} + 2\hat{k}$, $\vec{b} = 2\hat{i} - 3\hat{j} + \hat{k}$ and $\vec{c}$ is a vector such that $(\vec{a} \times \vec{b}) \times \vec{c} = \vec{a} \times (\vec{b} \times \vec{c})$, $|\vec{c}| = 6$, then answer the following questions :

27. $\vec{c}$ is
 (A) Parallel with $\vec{a}$ (B) Parallel with $\vec{b}$
 (C) Parallel with $\vec{a} \times \vec{b}$ (D) Coplanar with $\vec{a}$ and $\vec{b}$
28. Volume of parallelopiped whose coterminus edges are $\vec{a}$, $\vec{b}$ and $\vec{b} \times \vec{c}$ is
 (A) $(\vec{a} \times \vec{b})^2$ (B) $2(\vec{a} \times \vec{b})^2$ (C) 244 (D) 122

Paragraph for Question Nos. 29 to 30

Consider a line $z(1 - i) + \bar{z}(1 + i) - 2k = 0$ and the circle $z\bar{z} - (1 - 2i)z - (1 + 2i)\bar{z} - 13 = 0$.

29. The possible values of k so that the line is secant to the circle is/are
 (A) -3 (B) 4 (C) 6 (D) 9
30. The given circle can also be represented by the equation
 (A) $|z - 1 + 2i| = 18$ (B) $|z - 1 - 2i| = 3\sqrt{2}$
 (C) $|z + 1 + 2i| = 18$ (D) $|z + 1 + 2i| = 3\sqrt{2}$

Space for Rough Work

Paragraph for Question Nos. 31 to 32

Let $\overrightarrow{PR} = 3\hat{i} + \hat{j} - 2\hat{k}$ and $\overrightarrow{SQ} = \hat{i} - 3\hat{j} - 4\hat{k}$ determine diagonals of a parallelogram PQRS and $\overrightarrow{PT} = \hat{i} + 2\hat{j} + 3\hat{k}$ be another vector.

31. Area of the parallelogram PQRS is
 (A) $10\sqrt{3}$ (B) $5\sqrt{3}$ (C) $\frac{5\sqrt{3}}{2}$ (D) None of these
32. The volume of the parallelepiped determined by the vectors $\overrightarrow{PT}$, $\overrightarrow{PQ}$ and $\overrightarrow{PS}$ is
 (A) 5 (B) 20 (C) 10 (D) 30

Paragraph for Question Nos. 33 to 34

On a complex plane, let three points A, B, C with affixes z_1, z_2, z_3 respectively lie on unit circle $|z| = 1$. D is a point on BC such that AD is perpendicular to BC and AD is produced to a point E on the circle $|z| = 1$. Then

33. Orthocentre of $\triangle ABC$ is
 (A) $z_1 + z_2 + z_3$ (B) $z_1z_2 + z_2z_3 + z_3z_1$ (C) $z_1^2 + z_2^2 + z_3^2$ (D) none of these
34. Affix of the point E is
 (A) $-\frac{z_2z_1}{z_3}$ (B) $-\frac{z_2z_3}{z_1}$ (C) $-\frac{z_1z_3}{z_2}$ (D) $-\frac{\bar{z}_1z_3}{\bar{z}_2}$

Space for Rough Work

Paragraph for Question Nos. 35 to 36

Let $z_1, z_2, z_3, \dots, z_6$ are the roots of the equation $z^6 + z^5 + z^4 + z^3 + z^2 + z + 1 = 0$

35. Which of the following is/are True ?

- (A) $\sum_{i=1}^6 z_i^5 = -1$ (B) $\prod_{i=1}^5 z_i = -1$ (C) $\sum z_i^5 + \prod z_i = 0$ (D) $\sum_{i=1}^6 z_i^5 = 1$

36. $(2 - z_1)(2 - z_2)(2 - z_3)(2 - z_4)(2 - z_5)(2 - z_6) =$

- (A) 63 (B) 127 (C) 32 (D) 31

Paragraph for Question Nos. 37 to 38

Consider complex number $z = \frac{1 - i \sin q}{1 + i \cos q}$

37. The value of q for which z is purely imaginary are

- (A) $n\pi - \frac{\pi}{4}, n \in I$ (B) $n\pi + \frac{\pi}{4}, n \in I$ (C) $n\pi, n \in I$ (D) no real value of θ

38. The value of q for which $\arg(z) = \frac{\pi}{4}$ is given by

- (A) $n\pi \pm \pi/6$ (B) $n\pi \pm \frac{\pi}{3}$ (C) $n\pi \pm \frac{\pi}{4}$ (D) $(2n+1)\frac{\pi}{4}$

Space for Rough Work

Paragraph for Question Nos. 39 to 40

Let $\hat{u}, \hat{v}, \hat{w}$ be three non-coplanar unit vectors with angles between $\hat{u}$ and $\hat{v}$ is α , between $\hat{v}$ and $\hat{w}$ is β and between $\hat{w}$ and $\hat{u}$ is γ . Further $\vec{a}, \vec{b}, \vec{c}$ be unit vectors along angle bisectors of α, β, γ respectively.

39. $[\vec{a} + \vec{b} \quad \vec{b} + \vec{c} \quad \vec{c} + \vec{a}] =$

(A) $\frac{1}{2}[\hat{u} \hat{v} \hat{w}] \sec \frac{\alpha}{2} \sec \frac{\beta}{2} \sec \frac{\gamma}{2}$

(B) $[\hat{u} \hat{v} \hat{w}] \sec \frac{\alpha}{2} \sec \frac{\beta}{2} \sec \frac{\gamma}{2}$

(C) $\frac{1}{4}[\hat{u} \hat{v} \hat{w}] \sec \frac{\alpha}{2} \sec \frac{\beta}{2} \sec \frac{\gamma}{2}$

(D) $[\hat{u} \hat{v} \hat{w}] |\sec \alpha \sec \beta \sec \gamma|$

40. $[\vec{a} \times \vec{b} \quad \vec{b} \times \vec{c} \quad \vec{c} \times \vec{a}] =$

(A) $\frac{1}{4}[\hat{u} \hat{v} \hat{w}]^2 \sec^2 \frac{\alpha}{2} \sec^2 \frac{\beta}{2} \sec^2 \frac{\gamma}{2}$

(B) $\frac{1}{8}[\hat{u} \hat{v} \hat{w}]^2 \sec^2 \frac{\alpha}{2} \sec^2 \frac{\beta}{2} \sec^2 \frac{\gamma}{2}$

(C) $\frac{1}{16}[\hat{u} \hat{v} \hat{w}]^2 \sec^2 \frac{\alpha}{2} \sec^2 \frac{\beta}{2} \sec^2 \frac{\gamma}{2}$

(D) $\frac{1}{16}[\hat{u} \hat{v} \hat{w}]^2 \sec \frac{\alpha}{2} \sec \frac{\beta}{2} \sec \frac{\gamma}{2}$

Space for Rough Work