2014

SUBJECT : MATHEMATICS	DAY – 1
SESSION : AFTERNOON	TIME : 02.30 P.M. TO 03.50 P.M.

MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
60	80 MINUTES	70 MINUTES

MENTION YOUR CET NUMBER	QUESTION BOOKLET DETAILS	
	VERSION CODE	SERIAL NUMBER
	A - 1	348481

DOs :

1. Check whether the CET No. has been entered and shaded in the respective circles on the OMR answer sheet.
2. This Question Booklet is issued to you by the invigilator after the 2nd **Bell i.e., after 2.30 p.m.**
3. The Serial Number of this question booklet should be entered on the OMR answer sheet.
4. The Version Code of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DON'TS :

1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**
2. The 3rd **Bell rings at 2.40 p.m., till then;**
   - Do not remove the paper seal present on the right hand side of this question booklet.
   - Do not look inside this question booklet.
   - Do not start answering on the OMR answer sheet.

SEAL

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. This question booklet contains 60 questions and each question will have one statement and four distracters. (Four different options / choices.)
2. After the 3rd **Bell is rung at 2.40 p.m.,** remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
3. During the subsequent 70 minutes:
   - Read each question carefully.
   - Choose the correct answer from out of the four available distracters (options / choices) given under each question / statement.
   - **Completely darken / shade the relevant circle with a BLUE OR BLACK INK BALL POINT PEN against the question number on the OMR answer sheet.**

Correct Method of shading the circle on the OMR answer sheet is as shown below :

① ● ③ ④

4. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognised and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
5. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
6. After the **last bell is rung at 3.50 p.m.,** stop writing on the OMR answer sheet and affix your LEFT HAND THUMB IMPRESSION on the OMR answer sheet as per the instructions.
7. Hand over the **OMR ANSWER SHEET** to the room invigilator as it is.
8. After separating the top sheet (Our Copy), the invigilator will return the bottom sheet replica (Candidate's copy) to you to carry home for self-evaluation.
9. Preserve the replica of the OMR answer sheet for a minimum period of ONE year.

2014

1. Let S be the set of all real numbers. A relation R has been defined on S by $aRb \Leftrightarrow |a - b| \le 1$, then R is

   (1) reflexive and transitive but not symmetric
   (2) an equivalence relation
   (3) symmetric and transitive but not reflexive
   (4) reflexive and symmetric but not transitive

2. For any two real numbers, an operation $*$ defined by $a * b = 1 + ab$ is

   (1) commutative but not associative
   (2) associative but not commutative
   (3) neither commutative nor associative
   (4) both commutative and associative

3. Let $f : N \to N$ defined by $f(n) = \begin{cases} \frac{n+1}{2} & \text{if n is odd} \\ \frac{n}{2} & \text{if n is even} \end{cases}$

   then f is

   (1) one-one and onto
   (2) one-one but not onto
   (3) onto but not one-one
   (4) neither one-one nor onto

4. Suppose $f(x) = (x + 1)^2$ for $x \ge -1$. If $g(x)$ is a function whose graph is the reflection of the graph of $f(x)$ in the line $y = x$, then $g(x) =$

   (1) $-\sqrt{x} - 1$
   (2) $\sqrt{x} - 1$
   (3) $\frac{1}{(x+1)^2}$ $x > -1$
   (4) $\sqrt{x} + 1$

Space For Rough Work

5. The domain of the function $f(x) = \sqrt{\cos x}$ is

(1) $\left[0, \frac{\pi}{2}\right]$ (2) $\left[0, \frac{\pi}{2}\right] \cup \left[\frac{3\pi}{2}, 2\pi\right]$

(3) $\left[\frac{3\pi}{2}, 2\pi\right]$ (4) $\left[\frac{-\pi}{2}, \frac{\pi}{2}\right]$

6. In a class of 60 students, 25 students play cricket and 20 students play tennis, and 10 students play both the games, then the number of students who play neither is

(1) 0 (2) 35

(3) 45 (4) 25

7. Given $0 \le x \le \frac{1}{2}$ then the value of

$$\tan\left[\sin^{-1}\left\{\frac{x}{\sqrt{2}} + \frac{\sqrt{1-x^2}}{\sqrt{2}}\right\} - \sin^{-1}x\right] \text{ is}$$

(1) $\sqrt{3}$ (2) $\frac{1}{\sqrt{3}}$

(3) 1 (4) −1

8. The value of $\sin(2\sin^{-1}0.8)$ is equal to

(1) sin 1.2° (2) 0.96

(3) 0.48 (4) sin 1.6°

9. If A is 3×4 matrix and B is a matrix such that A'B and BA' are both defined, then B is of the type

(1) 3×4 (2) 3×3

(3) 4×4 (4) 4×3

Space For Rough Work

10. The symmetric part of the matrix $A = \begin{pmatrix} 1 & 2 & 4 \\ 6 & 8 & 2 \\ 2 & -2 & 7 \end{pmatrix}$ is

(1) $\begin{pmatrix} 1 & 4 & 3 \\ 2 & 8 & 0 \\ 3 & 0 & 7 \end{pmatrix}$ (2) $\begin{pmatrix} 1 & 4 & 3 \\ 4 & 8 & 0 \\ 3 & 0 & 7 \end{pmatrix}$

(3) $\begin{pmatrix} 0 & -2 & -1 \\ -2 & 0 & -2 \\ -1 & -2 & 0 \end{pmatrix}$ (4) $\begin{pmatrix} 0 & -2 & 1 \\ 2 & 0 & 2 \\ -1 & 2 & 0 \end{pmatrix}$

11. If A is a matrix of order 3, such that A (adj A) = 10 I, then |adj A| =

(1) 10 (2) 10 I

(3) 1 (4) 100

12. Consider the following statements :

(a) If any two rows or columns of a determinant are identical, then the value of the determinant is zero.

(b) If the corresponding rows and columns of a determinant are interchanged, then the value of the determinant does not change.

(c) If any two rows (or columns) of a determinant are interchanged, then the value of the determinant changes in sign.

Which of these are correct ?

(1) (a) and (b) (2) (b) and (c)

(3) (a) and (c) (4) (a), (b) and (c)

Space For Rough Work

13. The inverse of the matrix $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ is

(1) $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$

(2) $\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{3} & 0 \\ 0 & 0 & \frac{1}{4} \end{bmatrix}$

(3) $\frac{1}{24}\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$

(4) $\frac{1}{24}\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

14. If a, b and c are in A.P., then the value of $\begin{vmatrix} x+2 & x+3 & x+a \\ x+4 & x+5 & x+b \\ x+6 & x+7 & x+c \end{vmatrix}$ is

(1) $x - (a + b + c)$
(2) $9x^2 + a + b + c$
(3) 0
(4) $a + b + c$

15. The local minimum value of the function f' given by $f(x) = 3 + |x|, x \in R$ is

(1) 3
(2) 0
(3) – 1
(4) 1

16. A stone is dropped into a quiet lake and waves move in circles at the speed of 5 cm/sec. At that instant, when the radius of circular wave is 8 cm, how fast is the enclosed area increasing ?

(1) 8π cm^2/s
(2) 80π cm^2/s
(3) 6π cm^2/s
(4) $\frac{8}{3}$ cm^2/s

Space For Rough Work

17. A gardener is digging a plot of land. As he gets tired, he works more slowly. After 't' minutes he is digging at a rate of $\frac{2}{\sqrt{t}}$ square metres per minute. How long will it take him to dig an area of 40 square metres ?

(1) 10 minutes (2) 40 minutes
(3) 100 minutes (4) 30 minutes

18. The area of the region bounded by the lines $y = mx$, $x = 1$, $x = 2$, and x axis is 6 sq. units, then 'm' is

(1) 1 (2) 4
(3) 3 (4) 2

19. Area of the region bounded by two parabolas $y = x^2$ and $x = y^2$ is

(1) $\frac{1}{3}$ (2) 3
(3) $\frac{1}{4}$ (4) 4

20. The order and degree of the differential equation $y = x\frac{dy}{dx} + \frac{2}{\frac{dy}{dx}}$ is

(1) 1, 3 (2) 1, 1
(3) 1, 2 (4) 2, 1

21. The general solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = 3x$ is

(1) $y = x + \frac{c}{x}$ (2) $y = x^2 + \frac{c}{x}$
(3) $y = x - \frac{c}{x}$ (4) $y = x^2 - \frac{c}{x}$

Space For Rough Work

22. The distance of the point P(a, b, c) from the x-axis is

(1) $\sqrt{b^2 + c^2}$ (2) $\sqrt{a^2 + c^2}$

(3) $\sqrt{a^2 + b^2}$ (4) a

23. Equation of the plane perpendicular to the line $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and passing through the point (2, 3, 4) is

(1) $x + 2y + 3z = 9$ (2) $x + 2y + 3z = 20$

(3) $2x + 3y + z = 17$ (4) $3x + 2y + z = 16$

24. The line $\frac{x-2}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ is parallel to the plane

(1) $3x + 4y + 5z = 7$ (2) $x + y + z = 2$

(3) $2x + 3y + 4z = 0$ (4) $2x + y - 2z = 0$

25. The angle between two diagonals of a cube is

(1) 30° (2) 45°

(3) $\cos^{-1}\left(\frac{1}{3}\right)$ (4) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$

26. Lines $\frac{x-2}{1} = \frac{y-3}{1} = \frac{z-4}{-K}$ and $\frac{x-1}{K} = \frac{y-4}{2} = \frac{z-5}{1}$ are coplanar if

(1) K = 0 (2) K = – 1

(3) K = 2 (4) K = 3

Space For Rough Work

27. A and B are two events such that P(A) $\neq$ 0, P(B/A) if

(i) A is a subset of B

(ii) A $\cap$ B = Φ are respectively

(1) 0 and 1 (2) 1, 0

(3) 1, 1 (4) 0, 0

28. Two dice are thrown simultaneously. The probability of obtaining a total score of 5 is

(1) $\frac{1}{18}$ (2) $\frac{1}{12}$

(3) $\frac{1}{9}$ (4) $\frac{1}{36}$

29. If the events A and B are independent if $P(A') = \frac{2}{3}$ and $P(B') = \frac{2}{7}$, then P(A $\cap$ B) is equal to

(1) $\frac{5}{21}$ (2) $\frac{3}{21}$

(3) $\frac{4}{21}$ (4) $\frac{1}{21}$

30. A box contains 100 bulbs, out of which 10 are defective. A sample of 5 bulbs is drawn. The probability that none is defective is

(1) $\left(\frac{1}{10}\right)^5$ (2) $\left(\frac{1}{2}\right)^5$

(3) $\frac{9}{10}$ (4) $\left(\frac{9}{10}\right)^5$

31. The area of the parallelogram whose adjacent sides are $\hat{i} + \hat{k}$ and $2\hat{i} + \hat{j} + \hat{k}$ is

(1) $\sqrt{2}$ (2) $\sqrt{3}$

(3) 3 (4) 4

Space For Rough Work

32. If $\vec{a}$ and $\vec{b}$ are two unit vectors inclined at an angle $\frac{\pi}{3}$, then the value of $|\vec{a} + \vec{b}|$ is

(1) greater than 1 (2) less than 1

(3) equal to 1 (4) equal to 0

33. The value of $[\vec{a} - \vec{b} \quad \vec{b} - \vec{c} \quad \vec{c} - \vec{a}]$ is equal to

(1) 1 (2) 2

(3) 0 (4) $2\,[\vec{a} \ \vec{b} \ \vec{c}]$

34. If $x + y \leq 2, x \geq 0, y \geq 0$ the point at which maximum value of $3x + 2y$ attained will be

(1) (0, 0) (2) $\left(\frac{1}{2}, \frac{1}{2}\right)$

(3) (0, 2) (4) (2, 0)

35. If $\sin\theta = \sin\alpha$, then

(1) $\frac{\theta + \alpha}{2}$ is any odd multiple of $\frac{\pi}{2}$ and $\frac{\theta - \alpha}{2}$ is any multiple of π.

(2) $\frac{\theta + \alpha}{2}$ is any even multiple of $\frac{\pi}{2}$ and $\frac{\theta - \alpha}{2}$ is any odd multiple of π.

(3) $\frac{\theta + \alpha}{2}$ is any multiple of $\frac{\pi}{2}$ and $\frac{\theta - \alpha}{2}$ is any odd multiple of π.

(4) $\frac{\theta + \alpha}{2}$ is any multiple of $\frac{\pi}{2}$ and $\frac{\theta - \alpha}{2}$ is any even multiple of π.

Space For Rough Work

36. If $\tan x = \frac{3}{4}, \pi < x < \frac{3\pi}{2}$, then the value of $\cos\frac{x}{2}$ is

(1) $\frac{3}{\sqrt{10}}$ (2) $-\frac{3}{\sqrt{10}}$

(3) $-\frac{1}{\sqrt{10}}$ (4) $\frac{1}{\sqrt{10}}$

37. In a triangle ABC, a[b cos C – c cos B] =

(1) a^2 (2) b^2

(3) 0 (4) $b^2 - c^2$

38. If α and β are two different comlex numbers with $|\beta| = 1$, then $\left|\frac{\beta - \alpha}{1 - \bar{\alpha}\beta}\right|$ is equal to

(1) 0 (2) 1

(3) $\frac{1}{2}$ (4) – 1

39. The set $A = \{x : |2x + 3| < 7\}$ is equal to the set

(1) $B = \{x : -3 < x < 7\}$ (2) $C = \{x : -13 < 2x < 4\}$

(3) $D = \{x : 0 < x + 5 < 7\}$ (4) $E = \{x : -7 < x < 7\}$

40. How many 5 digit telephone numbers can be constructed using the digits 0 to 9, if each number starts with 67 and no digit appears more than once ?

(1) 336 (2) 337

(3) 335 (4) 338

Space For Rough Work

41. If 21^{st} and 22^{nd} terms in the expansion of $(1 + x)^{44}$ are equal, then x is equal to

(1) $\frac{21}{22}$ (2) $\frac{23}{24}$

(3) $\frac{8}{7}$ (4) $\frac{7}{8}$

42. Consider an infinite geometric series with first term 'a' and common ratio 'r'. If the sum is 4 and the second term is $\frac{3}{4}$, then

(1) $a = \frac{4}{7},\ r = \frac{3}{7}$ (2) $a = 3,\ r = \frac{1}{4}$

(3) $a = 2,\ r = \frac{3}{8}$ (4) $a = \frac{3}{2},\ r = \frac{1}{2}$

43. A straight line passes through the points (5, 0) and (0, 3). The length of perpendicular from the point (4, 4) on the line is

(1) $\frac{\sqrt{17}}{2}$ (2) $\sqrt{\frac{17}{2}}$

(3) $\frac{15}{\sqrt{34}}$ (4) $\frac{17}{2}$

44. Equation of circle with centre $(-a, -b)$ and radius $\sqrt{a^2 - b^2}$ is

(1) $x^2 + y^2 - 2ax - 2by - 2b^2 = 0$

(2) $x^2 + y^2 - 2ax + 2by + 2a^2 = 0$

(3) $x^2 + y^2 + 2ax + 2by + 2b^2 = 0$

(4) $x^2 + y^2 - 2ax - 2by + 2b^2 = 0$

45. The area of the triangle formed by the lines joining the vertex of the parabola $x^2 = 12y$ to the ends of Latus rectum is

(1) 18 sq. units (2) 19 sq. units

(3) 20 sq. units (4) 17 sq. units

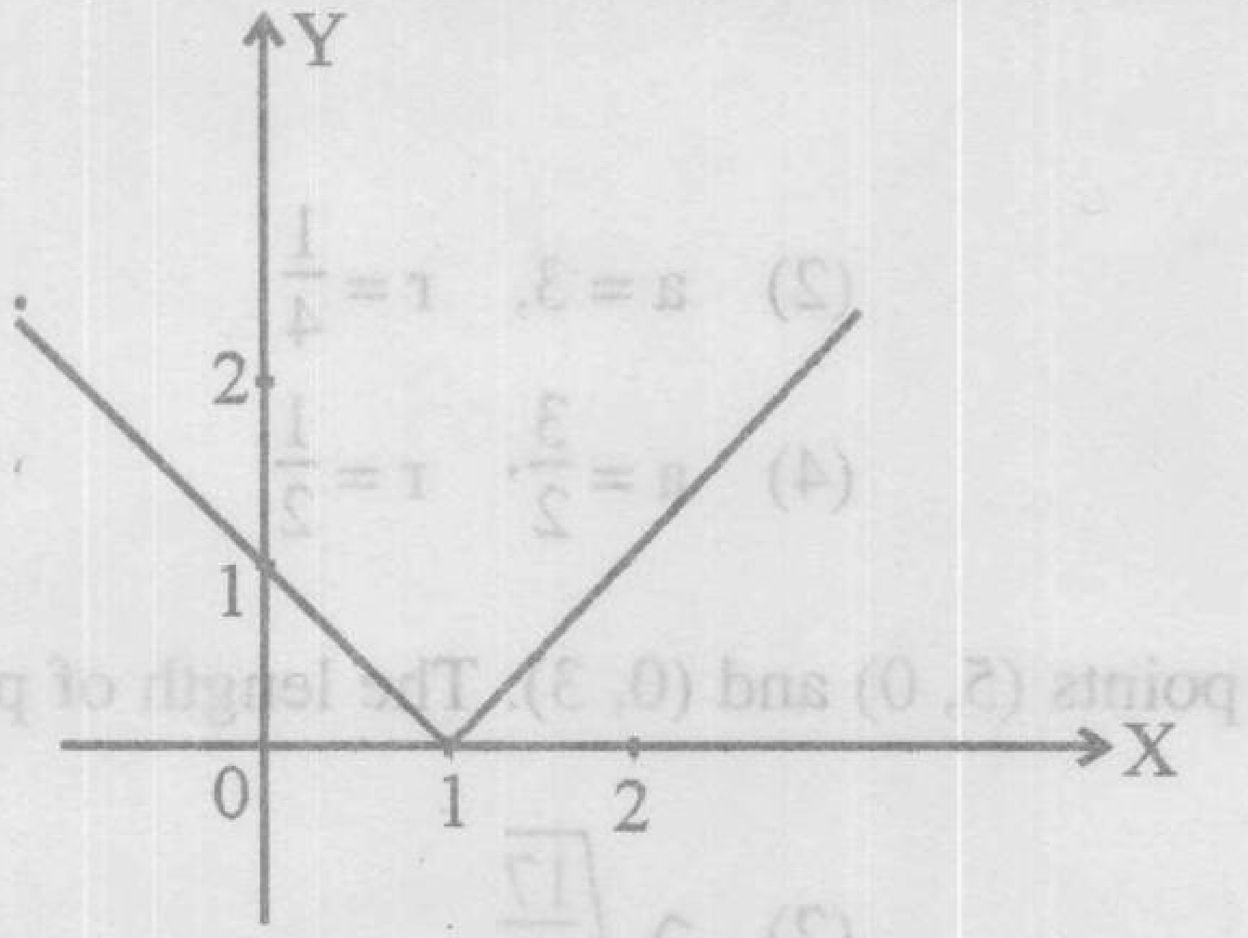
Space For Rough Work

46. If the coefficient of variation and standard deviation are 60 and 21 respectively, the arithmetic mean of distribution is

(1) 30 (2) 21

(3) 60 (4) 35

47. The function represented by the following graph is



(1) Differentiable but not continuous at $x = 1$

(2) Neither continuous nor differentiable at $x = 1$

(3) Continuous but not differentiable at $x = 1$

(4) Continuous and differentiable at $x = 1$

48. If $f(x) = \begin{cases} \dfrac{3 \sin \pi x}{5x} & x \neq 0 \\ 2K & x = 0 \end{cases}$

is continuous at $x = 0$, then the value of K is

(1) $\frac{3\pi}{10}$ (2) $\frac{3\pi}{5}$

(3) $\frac{\pi}{10}$ (4) $\frac{3\pi}{2}$

Space For Rough Work

49. Which one of the following is not correct for the features of exponential function given by $f(x) = b^x$ where $b > 1$?

(1) The domain of the function is R, the set of real numbers.

(2) The range of the function is the set of all positive real numbers.

(3) For very large negative values of x, the function is very close to 0.

(4) The point (1, 0) is always on the graph of the function.

50. If $y = (1 + x)(1 + x^2)(1 + x^4)$, then $\frac{dy}{dx}$ at $x = 1$ is

(1) 28 (2) 0

(3) 20 (4) 1

51. If $y = (\tan^{-1}x)^2$, then $(x^2 + 1)^2 y_2 + 2x(x^2 + 1)y_1$ is equal to

(1) 0 (2) 1

(3) 4 (4) 2

52. If $f(x) = x^3$ and $g(x) = x^3 - 4x$ in $-2 \le x \le 2$, then consider the statements :

(a) $f(x)$ and $g(x)$ satisfy mean value theorem.

(b) $f(x)$ and $g(x)$ both satisfy Rolle's theorem.

(c) Only $g(x)$ satisfies Rolle's theorem.

Of these statements

(1) (a) alone is correct. (2) (a) and (c) are correct.

(3) (a) and (b) are correct. (4) None is correct.

Space For Rough Work

53. Which of the following is not a correct statement ?

(1) $\sqrt{3}$ is a prime. (2) The sun is a star.

(3) Mathematics is interesting. (4) $\sqrt{2}$ is irrational.

54. If the function f(x) satisfies $\lim_{x \to 1} \frac{f(x) - 2}{x^2 - 1} = \pi$, then $\lim_{x \to 1} f(x) =$

(1) 2 (2) 3

(3) 1 (4) 0

55. The tangent to the curve y = $x^3 + 1$ at (1, 2) makes an angle θ with y axis, then the value of tan θ is

(1) 3 (2) $\frac{1}{3}$

(3) $-\frac{1}{3}$ (4) – 3

56. If the function f(x) defined by

$f(x) = \frac{x^{100}}{100} + \frac{x^{99}}{99} + ... + \frac{x^2}{2} + x + 1$, then $f'(0) =$

(1) 100 (2) – 1

(3) 100 f'(0) (4) 1

Space For Rough Work

57. If $f(x) = f(\pi + e - x)$ and $\int_{e}^{\pi} f(x)\, dx = \frac{2}{e + \pi}$, then $\int_{e}^{\pi} x f(x)\, dx$ is equal to

(1) $\frac{\pi + e}{2}$ (2) $\frac{\pi - e}{2}$

(3) $\pi - e$ (4) 1

58. If linear function $f(x)$ and $g(x)$ satisfy

$$\int [(3x - 1) \cos x + (1 - 2x) \sin x]\, dx = f(x) \cos x + g(x) \sin x + C, \text{ then}$$

(1) $f(x) = 3x - 5$ (2) $g(x) = 3 + x$

(3) $f(x) = 3(x - 1)$ (4) $g(x) = 3(x - 1)$

59. The value of the integral

$$\int_{-\pi/4}^{\pi/4} \log(\sec\theta - \tan\theta)\, d\theta \text{ is}$$

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{2}$

(3) 0 (4) π

60. $\int \frac{\sin 2x}{\sin^2 x + 2\cos^2 x}\, dx =$

(1) $\log(1 + \cos^2 x) + C$ (2) $\log(1 + \tan^2 x) + C$

(3) $-\log(1 + \sin^2 x) + C$ (4) $-\log(1 + \cos^2 x) + C$

Space For Rough Work

A-1

SEAL