IB Maths AI SL Paper 1 Question Bank
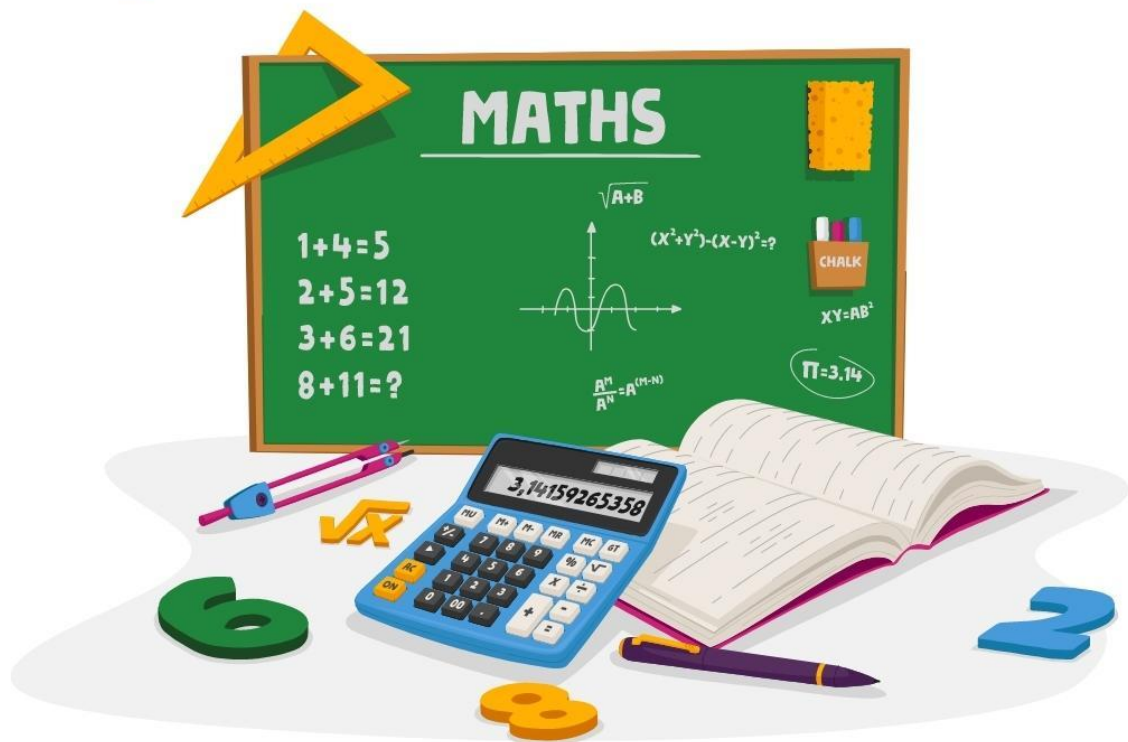
1. Let R be the region in the xy-plane that is enclosed by the graphs of $y = x^3$ and $y = x^2 - 6x + 8$.

(a) Find the volume of the solid generated when R is rotated about the x-axis.

First, we need to find the limits of integration. From the equation of the upper bound, $y = x^3$, we get $x = y^{1/3}$.

From the equation of the lower bound, $y = x^2 - 6x + 8$, we get $x = 2 + \sqrt{(y + 2)}$ and $x = 2 - \sqrt{(y + 2)}$.

So the volume of the solid generated when R is rotated about the x-axis is given by the definite integral:

$\int[2-\sqrt{(y+2)}, 2+\sqrt{(y+2)}] \, \pi(y^{2/3})^2 \, dy$

(b) Find the volume of the solid generated when R is rotated about the y-axis.

First, we need to find the limits of integration. From the equation of the upper bound, $y = x^3$, we get $x = y^{1/3}$.

From the equation of the lower bound, $y = x^2 - 6x + 8$, we get $x = 2 + \sqrt{(y + 2)}$ and $x = 2 - \sqrt{(y + 2)}$.

So the volume of the solid generated when R is rotated about the y-axis is given by the definite integral:

$2\pi \int[2-\sqrt{(y+2)}, 2+\sqrt{(y+2)}] \, x(y^{1/3}) \, dy$

2. Solve the equation $\tan^2 x = 3$ for $-\pi \leq x \leq \pi$

$\tan x = \pm\sqrt{3}$

For $\tan x = \sqrt{3}$

$x = \pi/3, \, x = -2\pi/3$

For $\tan x = -\sqrt{3}$

$x = -\pi/3, \, x = 2\pi/3$

3. Consider the quadratic $-4x^2 + 120x - 800$

(a) (i) Find the roots.

$x = 10, \, x = 20$

(ii) Hence express the quadratic in the form $y = a(x - x_1)(x - x_2)$

$y = -4(x - 10)(x - 20)$

(b) (i) Find the coordinates of the vertex.

$(15, 100)$

(ii) Hence express the quadratic in the form $y = a(x - h)^2 + k$

$y = -4(x - 15)^2 + 100$

(iii) Write down the equation of the axis of symmetry

x=15

(iv) Write down the maximum value of y
Ymax= -100

(c) Write down the y- intercept of the quadratic
y= -800

4. Solve the equation: $(\ln x)^2 - \ln x^2 + 1 = 0$
$x^2 - 2x + 1 = 0$
x= 1
lnx = 1
Hence, x = e

5. Solve the equation $2\sin^2 x = \sin x$ for $0 \le x \le 2\pi$
$2\sin^2 x - \sin x = 0$
$\sin x(2\sin x - 1) = 0$
Sinx = 0
And 2sinx -1 = 0
Sinx = 1/2
For sinx, x = 0, x= π, x = 2π
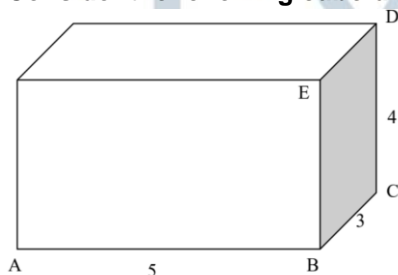For sinx = 1/2, x=π/6, x= 5π/6

6. Let $f(x) = 2x^2 - 12x + 10$. Find the tangent and normal line at x = 2.
Tangent line = y + 6 = -4(x -2)
Normal line = y + 6 = ¼ (x - 2)

7. Consider the following cuboid of dimensions 5*3*4, as shown.

(a) Find the length AC.
$AC^2 = 5^2 + 3^2$
AC = √34

(b) Find the length AD.
$AD^2 = \sqrt{34}^2 + 4^2 = \sqrt{50}$

(c) Find the angle of elevation from A to E.
tanEAB = 4/5
EAB = 38.7°

(d) Find the angle of elevation from A to D.
tanDAC = 4/√34
DAC= 34.4°

8. Solve 2sinx = tan x, where -π/2≤ x ≤ π/2
2sinxcosx - sinx = 0
sinx(2cosx - 1) = 0
Sinx = 0, cosx= 1/2
sinx=0, hence x= ±π/3

9. In a class, 40 students take chemistry only, 30 take physics only, 20 take both chemistry and physics, and 60 take neither.

(a) Find the probability
(i) that a student takes physics given that the student takes chemistry.
P(P I C)= 20/(20+40) = ⅓

(ii) that a student takes physics given that the student does not take chemistry.
P(P I C'') = 30/ (30+60) = ⅓

(b) State whether the events "taking chemistry" and "taking physics" aremutually exclusive, independent, or neither. Justify your answer.
P is independent of C since P(P I C) = P(P) = ⅓

10. The random variable X is normally distributed with μ= 100. It given that P(X > 130) = 0.2 Write down the values of the following probabilities
(a) P(X < 130)
P(X < 130) = 0.8

(b) P(X < 70)
P(X < 70) = 0.2

(c) P(100<X < 130)
P(100<X < 130) = 0.3

(d) P(70<X < 130)
P(70<X < 130) = 0.6

11. For the event A and B, P(A) = 0.6, P(B) = 0.8 and P(A∪B) = 1
a) Find P(A∩B)
P(A∩B)= 0.6 + 0.8 - 1 = 0.4

b) Find P(A'∪ B')
P(A'∪ B') = 0.6

TYCHR
Friend, Philosopher, Guide

🌐 **WWW.TYCHR.COM**

📞 **+91 9540653900**