

14. Solve the equation

$$\ln(x^2 - 15) = 0.$$

ln $\ln(x^2 - 15) = 0$ | $x^2 = 16$
 $x^2 - 15 = 1$ | $x = \sqrt{16} = \pm 4$

(2 marks)

15. Find the x -coordinate of the centroid of the solid obtained by rotating completely about the x -axis the finite region bounded by the curve $y^2 = 8x$, the x -axis and the line $x = 1$.

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(4 marks)

16. An equation of a curve is given parametrically by
 $x = 2 \cos \theta$, $y = 3 \sin \theta$.
 Find the cartesian equation of the curve.

$x =$

(2 marks)

17. Use the trapezoidal rule to find, approximately, the value of

$$\int_0^4 y \, dx,$$

given the following table:

x	0	1	2	3	4
y	3	5	6	4	3

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(3 marks)

18. Find the coordinates of the point of inflexion on the curve
 $y = xe^x$.

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(4 marks)

19. Find the number of different permutations of the 8 letters of the word CAUCASUS.
 Find the number of selections of 3 different letters which can be made from the letters of the word CAUCASUS.

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(4 marks)

20. (a) Simplify $\frac{(r+1)!}{(r-1)!}$, where r is a positive integer.

- (b) Evaluate $\sum_{r=1}^{10} r(r+1)$.

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(4 marks)

21. Given that θ is constant, find

$$\lim_{x \rightarrow 0} \frac{\sin(x + \theta) - \sin(\theta - x)}{2x}$$

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(3 marks)

22. Find the coefficient of x^2 in the series expansion of $(1 + 3x)^{-\frac{1}{2}}$ in ascending powers of x .
State the range of values of x for which the series converges.

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(3 marks)

23. Solve the differential equation

$$(y - 2x^2y) \frac{dy}{dx} = x,$$

given that $y = 0$ when $x = 0$.

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(5 marks)

1. Find the values of x for which $2^{2x+1} - 3(2^x) + 1 = 0$.

$2^{2x} \cdot 2^1 - 3$
 $\Rightarrow x = 0$ or $x = -1$
 (4 marks)

* 2. Find the set of real values of x for which $|x-1| > 2$.

$x-1 > 2$ or $x-1 < -2$
 $x > 3$ or $x < -1$
 (3 marks)

3. A real-valued function f is defined by $f(x) = x^2 + 6$. Show that f is not injective and find the range of f .

$f(x) = f(-x)$
 (4 marks)

4. Express $\frac{i}{(2-i)^2}$ in the form $a + bi$, where $a, b \in \mathbb{R}$.

(3 marks)

5. Given that $y = 4^{\sin x}$, find $\frac{dy}{dx}$ when $x = \frac{\pi}{6}$.

$\frac{dy}{dx} = 4^{\sin x} \ln 4 \cos x$
 (4 marks)

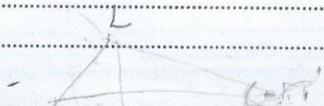
6. With respect to the origin O , the position vectors of the points L , M and N are $4\mathbf{i} + 7\mathbf{j} + 2\mathbf{k}$ and $2\mathbf{i} + 4\mathbf{j} + 6\mathbf{k}$ respectively. Find $\cos \angle LMN$.

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(4 marks)

7. A relation R is defined on Z , the set of integers, by $a R b$ if and only if $a - b$ is even. Show that R is transitive.

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(3 marks)

8. Evaluate

$$\int_1^2 \frac{x^3}{1+x^4} dx.$$

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(3 marks)

9. State the equations of the three asymptotes of the curve

$$y = \frac{(x-1)^2}{(x-2)(x-3)}.$$

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(3 marks)