GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

JUNE EXAMINATION
GRADE 12
2026

TECHNICAL MATHEMATICS

(PAPER 1)

ANSWER ALL THE QUESTIONS IN THE QUESTION PAPER.

SURNAME:										
NAME:										
SCHOOL:										
DATE:	**2**	**0**	**2**	**6**	**-**	**M**	**M**	**-**	**D**	**D**

	MARKER				MODERATOR			
QUESTION	**MARKS**			**MARKER'S INITIALS**	**MARKS**			**MODERATOR'S INITIALS**
1	**0**				**0**			
2	**0**				**0**			
3	**0**				**0**			
4	**0**				**0**			
5	**0**				**0**			
6	**0**				**0**			
7	**0**				**0**			
8	**0**				**0**			
9	**0**				**0**			
				TOTAL				

TIME: 3 hours
MARKS: 150

28 pages + a 2-page information sheet

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of NINE questions.
2. Answer ALL the questions in the spaces provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. If necessary, round-off answers to TWO decimal places, unless stated otherwise.
6. Diagrams are NOT necessarily drawn to scale.
7. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
8. An INFORMATION SHEET with formulae is included at the end of the question paper.
9. Candidates may NOT retain a question paper or remove it from the examination room. Question papers must be returned to the invigilator at the end of the examination session.
10. Answers must be written in blue/black ink as distinctly as possible. Do NOT write in the margins.
11. Indicate the questions you have answered by drawing a circle around the relevant numbers on the front cover of the question paper where marks are to be recorded.
12. Draw a neat line through any work/rough work that must NOT be marked.
13. If you use the additional space provided:

    13.1 Write down the number of the question.
    13.2 Leave a line and rule off after your answer.

14. Write neatly and legibly.

KEEP THIS PAGE BLANK.

QUESTION 1

1.1	Solve for x:	
1.1.1	$(2x-1)(x-1)=0$	(2)
1.1.2	$2x^2-3x-1=0$ (Correct to TWO decimal places)	(3)
1.1.3	$x(2x+1)-3\leq 0$	(3)

1.2	Solve for x and y if: $y + x = 2$ and $x^2 + y^2 = 2$	
		(6)

1.3	A florist uses a plastic cylindrical vase for a floral arrangement. She fills the vase with water. Her friend wants to use the following formula to calculate the radius (r) of the vase: $Volume = \pi r^2 h$	
1.3.1	Make r the subject of the formula.	
		(2)

1.3.2	Hence, or otherwise, calculate the diameter of the vase in millimetres, if the capacity is 4,434 l and the height $h = 28$ cm. (Hint: 1 000 $\text{cm}^3 = 1\ l$)	
		(4)

1.4	Simplify the following expression and leave your answer in binary form. (Show ALL calculations.) $25 + 11001_2$	
		(3)

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QUESTION 2

2.1	Given: $x^2 - 3x = -3$	
2.1.1	Determine the numerical value of the discriminant (Δ).	(3)
2.1.2	Hence, describe the nature of the roots of the equation.	(1)
2.2	Determine the numerical value of k for which the equation $2x^2 + (k-3)x + 8 = 0$ will have equal roots.	(5)

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QUESTION 3

3.1	Simplify the following **without the use of a calculator**. (Leave the answers with positive exponents.)	
3.1.1	$\dfrac{m^6n^8}{(m^2n)^4}$	(2)
3.1.2	$(\sqrt{2}+\sqrt{3})^2$	(3)
3.1.3	$\dfrac{(a^2)^{2b+3c}\times(a^3)^{b-c}}{a^{3b-c}\times a^{b+2c}}$	(4)

3.1.4	$\log_2(0,25)^2$	(4)

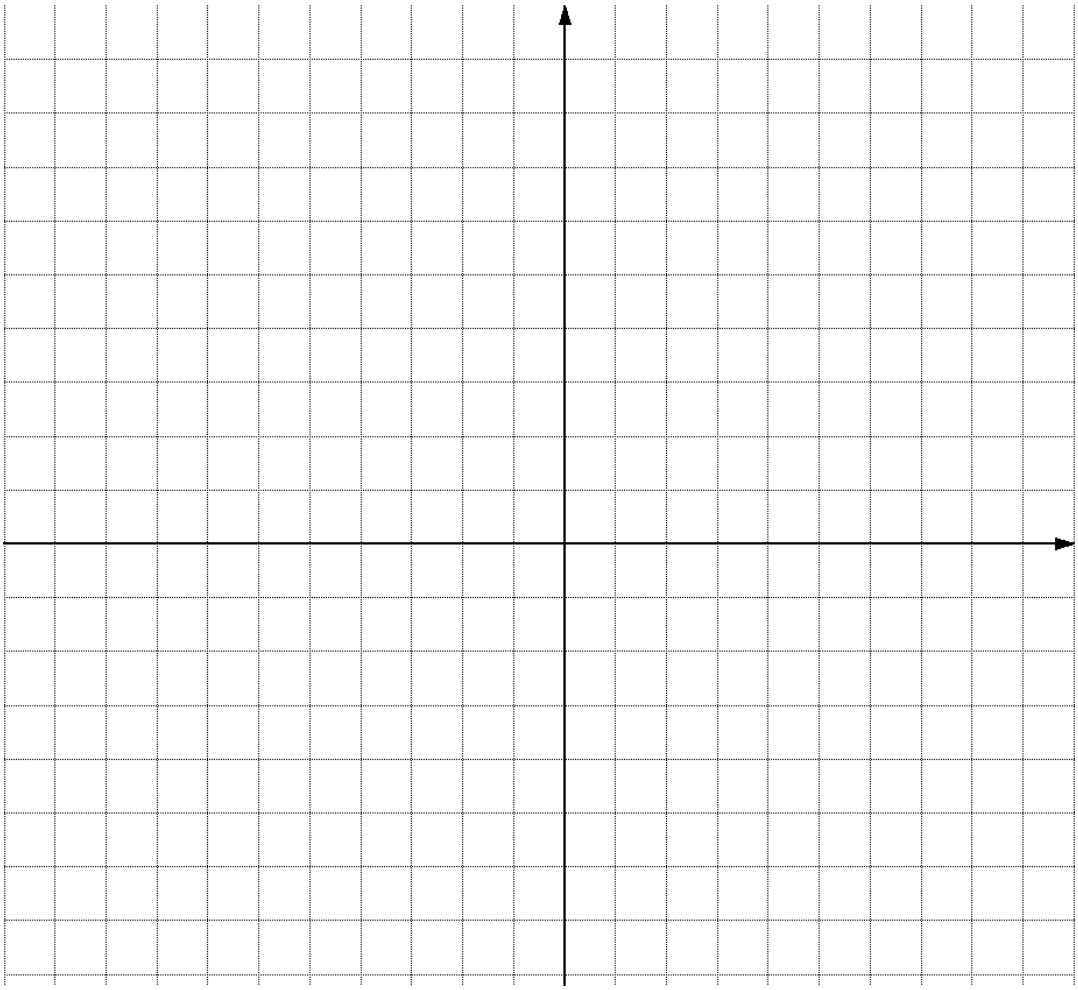
3.2	Solve for x: $\log_x 8 - \log_x \frac{1}{2} + \log_x 4 = 3$	(4)

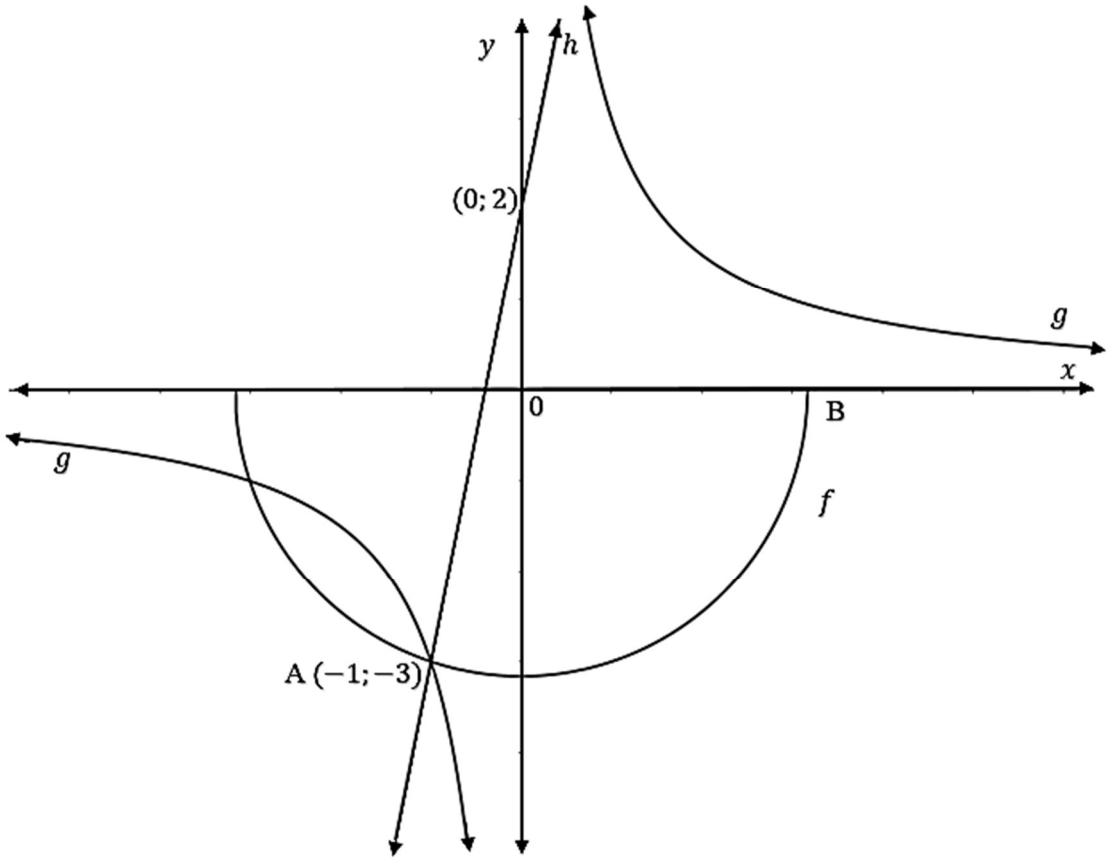
3.3	The conjugate of z is given as $\bar{z} = 4 - \sqrt{5}i$.	
3.3.1	Write down the expression of z.	(1)
3.3.2	Express z in the form $z = rcis\theta$.	(5)

[23]

QUESTION 4

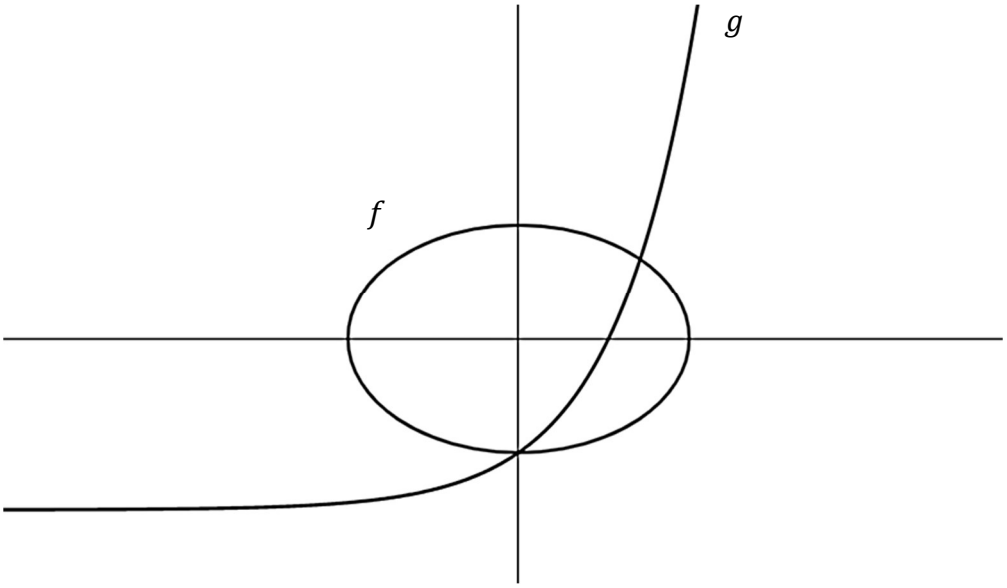
4.1	The function defined by $f(x) = 3x^2 - 6x - 9$ is given.	
4.1.1	Determine the x-intercepts of $f(x)$.	(4)
4.1.2	Determine the turning point of $f(x)$.	(3)
4.1.3	Write down the equation of the tangent that passes through the turning point of graph f.	(2)

4.1.4	Sketch the graph of f on the set of axes below. Clearly show the intercepts with the axes. 	(4)
4.1.5	Use the graph of f to determine value(s) of x, if $3x^2 - 6x - 9 \leq 0$.	(2)

4.2	The figure below shows the graph of: The semicircle, $f(x) = -\sqrt{r^2 - x^2}$ The hyperbola, $g(x) = \frac{a}{x}$ The straight line, $h(x) = mx + c$ The graphs of f, g and h intersect at point $A(-1; -3)$. B is the x-intercept of f. Point $(0; 2)$ is the y-intercept of h. 	

4.2.1	Determine the equation of g.	(3)

4.2.2	Determine the equation of h.	(4)
4.2.3	Determine the radius of the semicircle.	(2)

4.3	The graph below represent the functions defined by: $f(x): \frac{x^2}{9} + \frac{y^2}{b^2} = 1$ and $g(x) = 2^x - 3$ $f(x)$ and $g(x)$ share the same negative y-intercept.  	
4.3.1	Determine the equation of the asymptote of g.	(1)
4.3.2	Determine the y-intercept of g.	(2)

4.3.3	Hence, determine the value of b.	(1)

4.3.4	Determine the domain of f.	(2)

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QUESTION 5

5.1	The population of a certain species of bird was estimated to be decreasing at an annual compound rate of 10% of its total at the beginning of each year. If the population at the beginning of a year was 40 000, calculate after how many years it would decrease to 1 000. (Round-off the answer to the nearest year.)	(4)

5.2	Priscilla invests R1 800 for 6 years. At the end of this term, it is worth R3 277. Use a suitable formula to calculate the rate of interest of the investment if interest is compounded annually. (Round-off the answer to 1 decimal digit.)	
		(3)

5.3	Calculate the effective interest rate if an investment offers a nominal rate of 8,5% p.a., compounded monthly.	
		(3)

5.4	Thandi opened a savings account with an initial deposit of R12 000. The account offered an interest rate of 6% per annum compounded quarterly. After 2 years, she made an additional deposit of R5 000 into the same account. The interest rate remained the same, but from that point, the interest was compounded monthly. Calculate the total amount in the account after 7 years.	(5)

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QUESTION 6

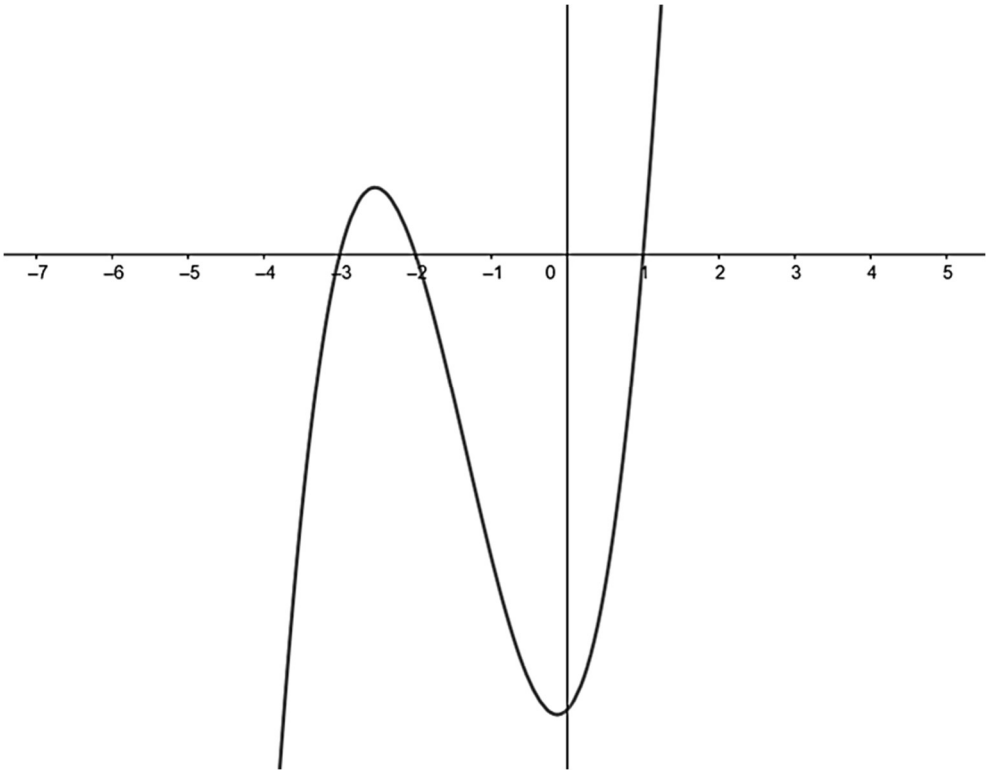
6.1	Determine $f'(x)$ using FIRST PRINCIPLES if $f(x) = 7 + 5x$.	(5)
6.2	Determine: $D_x\left[\frac{1}{3}x^3 + 4\sqrt{x} - \frac{2}{x}\right]$	(5)

6.3	Given: $g(x) = \frac{x^2-7x}{20} + 15$ Determine the gradient of g when $x = 5$.	
		(4)

[14]

QUESTION 7

The sketch below shows the function $f(x) = ax^3 + bx^2 + cx + d$, with the x-intercepts at $x = -3$, $x = -2$ and $x = 1$.

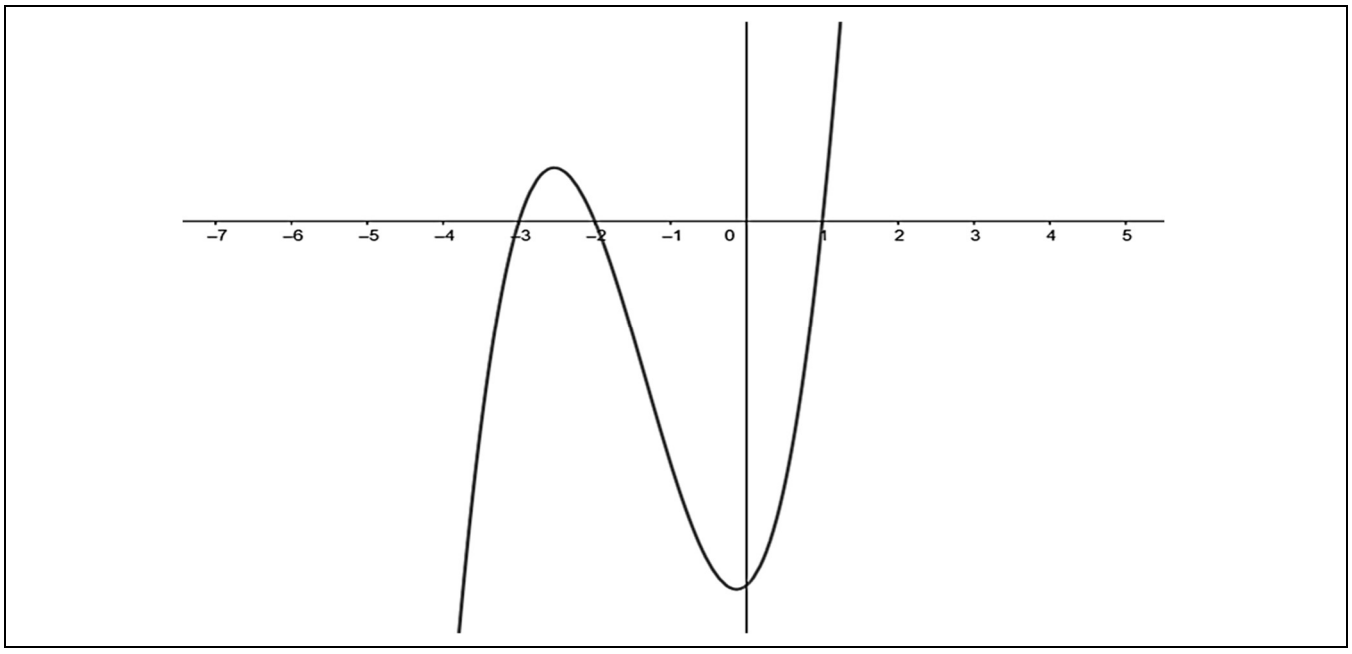


7.1 Show that the equation of the function can be written as $f(x) = x^3 + 4x^2 + x - 6$. (5)

7.2 Write down the coordinates of the y-intercept of f. (2)

7.3	Hence, determine the coordinates of the turning point(s) of f.	(5)
7.4	For which values of x is f decreasing?	(2)

[14]

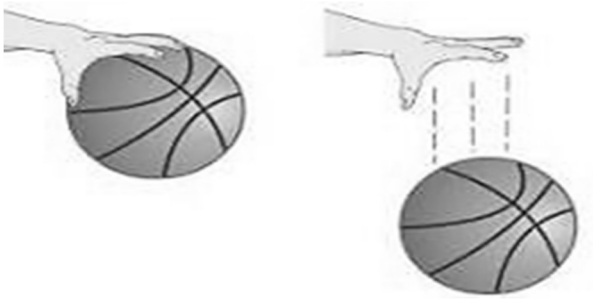


QUESTION 8

One of the kinematic equations, which describe motion with constant acceleration, is given by $s = ut + \frac{1}{2}gt^2$ where:

s is the displacement of an object, in metres
u is the initial velocity of an object, in m/s
t is the time taken for the fall, in seconds
g is the gravitational acceleration = 10 m/s^2

This photo below shows a ball falling out of a person's hand to the ground.



8.1	Determine the displacement of the ball after 6 seconds, if its initial velocity was 5 m/s.	(2)
8.2	Write down the equation for the velocity of this object.	(2)

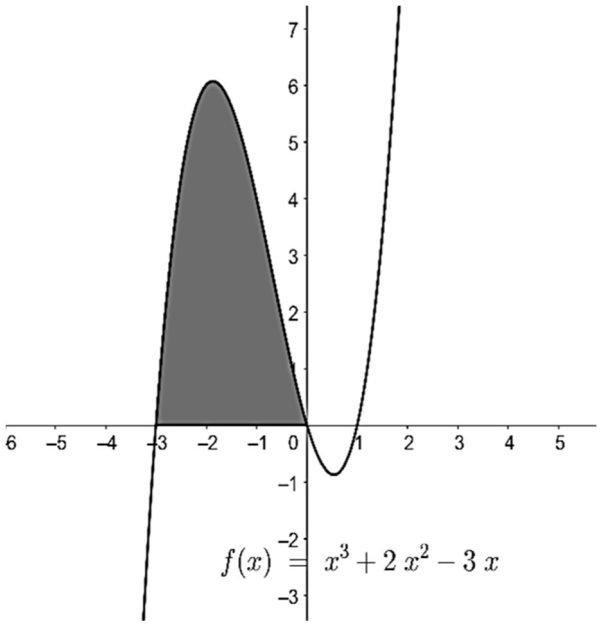
8.3	Hence or otherwise, calculate the velocity after 6 seconds if the initial velocity was 5 m/s.	
		(2)
8.4	Determine the average rate of change over the period of 6 seconds.	
		(2)
		[8]

QUESTION 9

9.1	Determine the following integrals:	
9.1.1	$\int \left(3x^2 + \frac{3}{x} - 2^x\right) dx$	
		(4)

9.1.2	$\int (\sqrt{x^4} + 2)^2 \, dx$	
		(5)

9.2 The sketch below shows the shaded area bound by the function $f(x) = x^3 + 2x^2 - 3x$ and the x-axis between the points where $x = -3$ and $x = 0$.



Determine the shaded area bound by function f and between the points $x = -3$ and $x = 0$.

Show ALL calculations.

(5)

[14]

ADDITIONAL SPACE		

ADDITIONAL SPACE		

TOTAL: 150

INFORMATION SHEET: TECHNICAL MATHEMATICS

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \qquad x = -\frac{b}{2a} \qquad y = \frac{4ac - b^2}{4a}$$

$$a^x = b \Leftrightarrow x = log_a\, b, \qquad a > 0, a \neq 1 \text{ and } b > 0$$

$$A = P(1 + ni) \qquad A = P(1 - ni) \qquad A = P(1 + i)^n \qquad A = P(1 - i)^n$$

$$i_{eff} = \left(1 + \frac{i}{m}\right)^m - 1$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$\int x^n dx = \frac{x^{n+1}}{n+1} + C, n \neq -1 \qquad \int kx^n dx = k.\frac{x^{n+1}}{n+1} + C, n \neq -1$$

$$\int \frac{1}{x} dx = \ln x + C, x > 0 \qquad \int \frac{k}{x} dx = k\, ln\, x + C, x > 0$$

$$\int a^x\, dx = \frac{a^x}{\ln a} + C, a > 0 \qquad \int ka^{nx} dx = k.\frac{a^{nx}}{n \ln a} + C, a > 0$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad \text{M}\left(\frac{x_2 + x_1}{2}; \frac{y_2 + y_1}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad tan\,\theta = m$$

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

In ΔABC: $\qquad \frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC} \qquad a^2 = b^2 + c^2 - 2bc.cosA$

Area of $\Delta ABC = \frac{1}{2}ab.sinC$

$$sin^2\theta + cos^2\theta = 1 \qquad 1 + tan^2\theta = sec^2\theta \qquad 1 + cot^2\theta = cosec^2\theta$$

$\pi rad = 180°$

Angular velocity $= \omega = 2\pi n$ where n = rotation frequency

Angular velocity $= \omega = 360°n$ where n = rotation frequency

Circumferential velocity $= v = \pi Dn$ where D = diameter and n = rotation frequency

Circumferential velocity = $v = \omega r$ where ω = angular velocity and r = radius

Arc length $= s = r\theta$ where r = radius and θ = central angle in radians

Area of a sector $= \frac{rs}{2}$ where r = radius, s = arc length

Area of a sector $= \frac{r^2\theta}{2}$ where r = radius and θ = central angle in radians

$4h^2 - 4dh + x^2 = 0$ where h = height of segment, d = diameter of circle and x = length of chord

$A_T = a(m_1 + m_2 + m_3 + \cdots + m_n)$ where a = width of the equal parts, $m_1 = \frac{o_1+o_2}{2}$ $O_n = n^{th}$ ordinate and n = number of ordinates

OR

$A_T = a\left(\frac{o_1 + o_n}{2} + o_2 + o_3 + \cdots + o_{n-1}\right)$ where a = width of the equal parts, $O_n = n^{th}$ ordinate and n = number of ordinates

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