education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 11

TECHNICAL MATHEMATICS P2

NOVEMBER 2024

MARKS: 150

TIME: 3 hours

This question paper consist of 13 pages, and a 2-page information sheet.

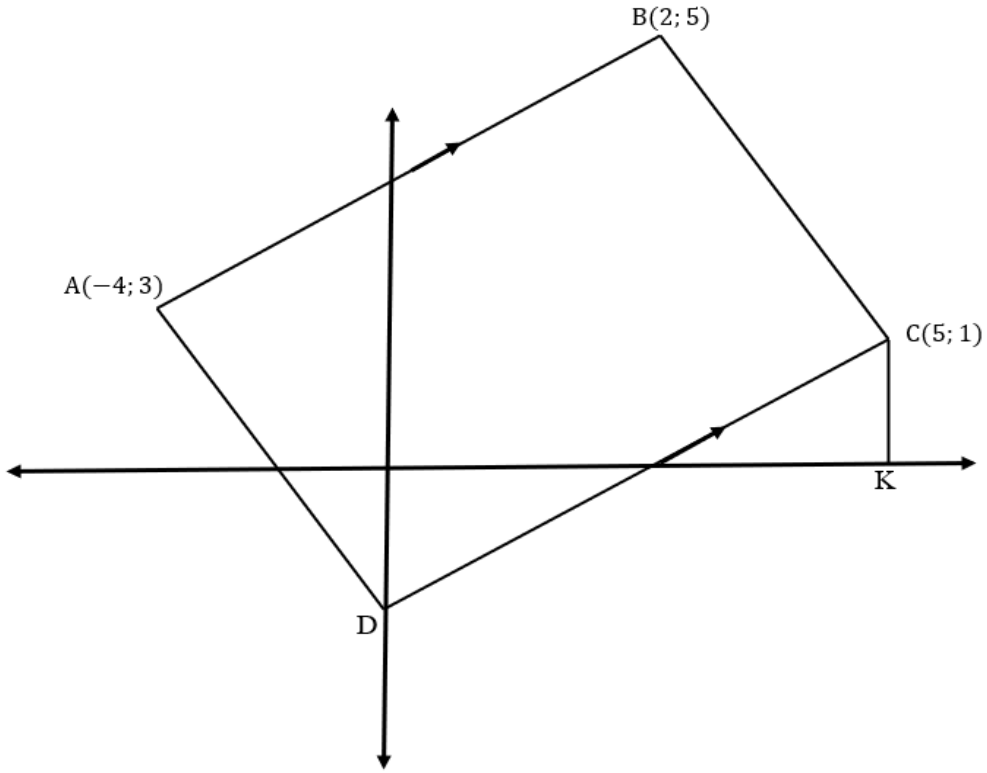
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 11 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK 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. Write neatly and legibly.

QUESTION 1

The diagram below has vertices A(-4;3), B(2;5), C(5;1), D and K, and $AB \parallel DC$.



1.1 Write down the coordinates of K. (2)

1.2 Determine the length of AB. (2)

1.3 Calculate the gradient of BC. (3)

1.4 Determine the equation of line DC in the form y ... (4)

1.5 Write down the coordinates of D. (2)

1.6 Calculate the size of ADC. (7)

1.7 Is ABCD a parallelogram? Substantiate your answer (3)
[23]

QUESTION 2

2.1 Given: A(2;1), B(3;p) and C(-3;-6),
calculate the value of p if A,B and C are collinear points. (4)
[4]

QUESTION 3

3.1 Given: $\theta = 45°$ and $\beta = 60°$

Calculate the numerical value of;

3.1.1 $\cos 3\theta$ (2)

3.1.2 $\dfrac{\cos^2 \beta - 2}{\text{cosec}\,\theta}$ (3)

3.2 Given: $3\tan\theta - \sqrt{3} = 0$ and $90° < \theta < 360°$.

Determine the value of the following, **without using a calculator**,
with the aid of a diagram,

3.2.1 $\sin\theta.\sec\theta$ (6)

3.2.2 $\dfrac{\tan\theta}{\cot\theta}$ (3)

3.2.3 $1 - 2\sin^2\theta$ (2)

3.3 Solve for β if $\beta \in [0°;360°]$ (rounded off to ONE decimal place)

$3\cos\beta = -1,02674$ (4)
[20]

QUESTION 4

4.1 Complete the following identities:

4.1.1 $\sec^2 x - \tan^2 x = ...$ (2)

4.1.2 $1 - \cos^2 x = ...$ (1)

4.2 Simplify:

4.2.1 $\dfrac{\cos(180° - \theta).\tan(360° - \theta).\cot(\pi + \theta)}{\cos(360° - \theta).\sin(180° + \theta)}$ (7)

4.2.2 $\text{cosec}^2\beta + \sec^2\beta.\cos^2\beta - \sin^2\beta - \cot^2\beta - 1$ (4)
[14]

QUESTION 5

Given: $f(x) = \sin x - 2$ and $g(x) = 2\cos x$ for $x \in [0°; 360°]$

5.1 Sketch the graph of functions of $f(x)$ and $g(x)$ on the same set of axes on the ANSWER SHEET provided. (6)

5.2 Write down the amplitude of f. (1)

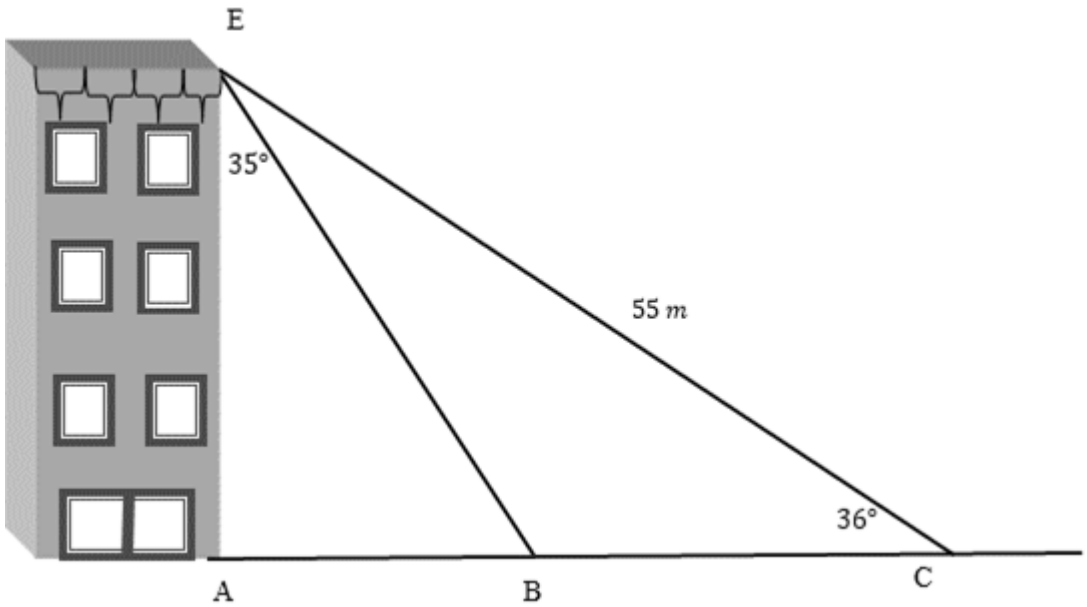
5.3 For which values of x is $f(x) \geq 0$ (2)

5.4 For which values of x is $g(x).f(x) \leq 0$ (2)

[11]

QUESTION 6

Two friends Edward and Conny are performing an experiment, Edward is standing on top of the building and there is a bus parked next to the building at B. Edward is looking down at the bus(B) with an angel of $35°$, while Conny is looking at Edward at an angle of $36°$. The distance between Edward and Conny from the top of the building is $55m$.



6.1 Calculate the distance between Edward (E) and the ground (A). (3)

6.2 Calculate the distance from the Bus (B) to where Conny (C) is standing. (6)

6.3 How far is Conny (C) from the building (A)? (3)

[12]

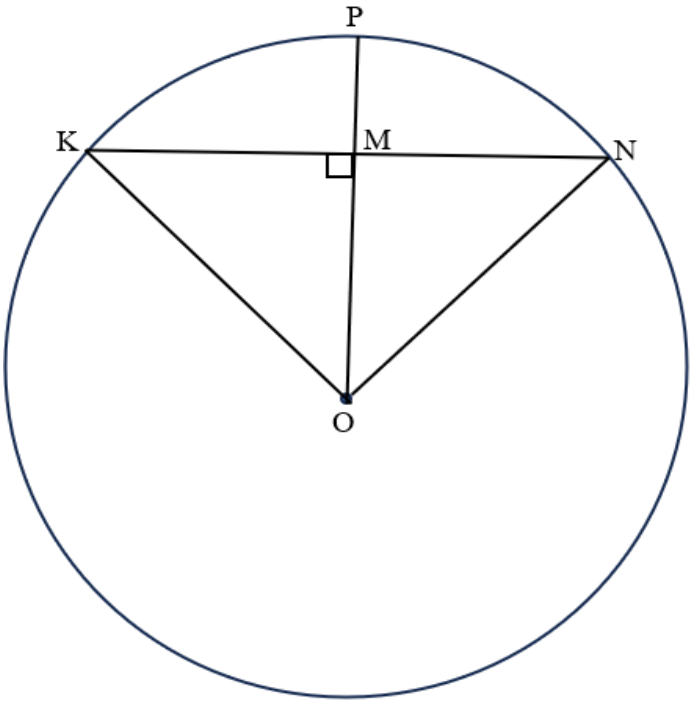
QUESTION 7

7.1 Complete the following theorems:

7.1.1 The exterior angle of a cyclic quadrilateral is equal to … (1)

7.1.2 The angle between the tangent to a circle and the chord drawn from the point of contact is … (1)

7.2 The diagram below shows a circle with center O. $OMP \perp KMN$, $KN = 50$ units and $OM = 6$ units.



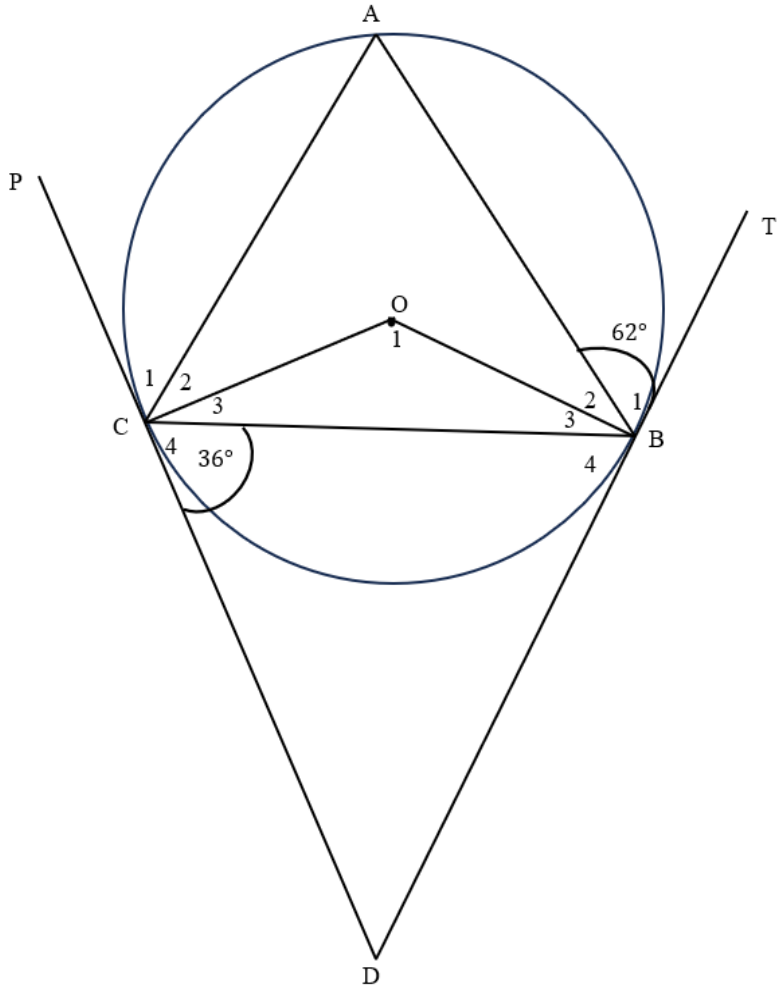
Determine, stating reasons the length of PM. (5)
[7]

QUESTION 8

8.1 In the diagram below O is the center, A, C and B are points on the circumference of the circle.

PCD and TBD are tangents to the circle at points C and B respectively.

$C_4 = 36°$ and $B_1 = 62°$.



8.1.1 Give, with reasons, TWO other angles, each equal to $36°$ (4)

8.1.2 Determine with reasons the sizes of the following angles.

a. $\widehat{O_1}$ (2)

b. C_3 (2)

c. D (2)

d. ACB (2)

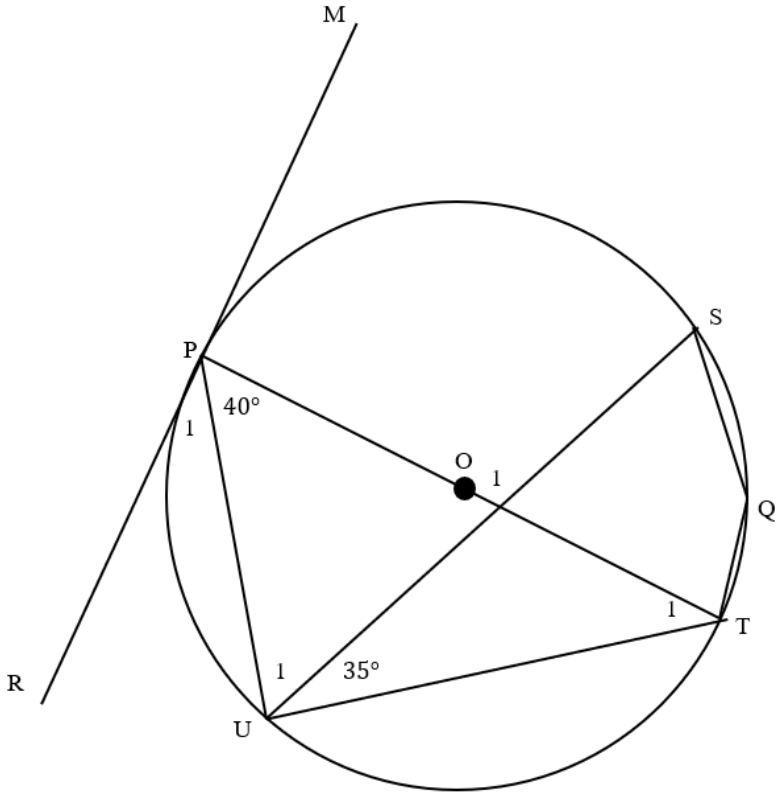
8.1.3 Give a reason why CD = BD (1)

8.2 The diagram below has points P, U, T, Q and S on the circumference of the circle.

O is the center of the circle.

MPR is a tangent to the circle at point P.

$\text{UPO} = 40°$ and $\text{SUT} = 35°$.



8.2.1 U_1 (2)

8.2.2 O_1 (2)

8.2.3 Q (2)

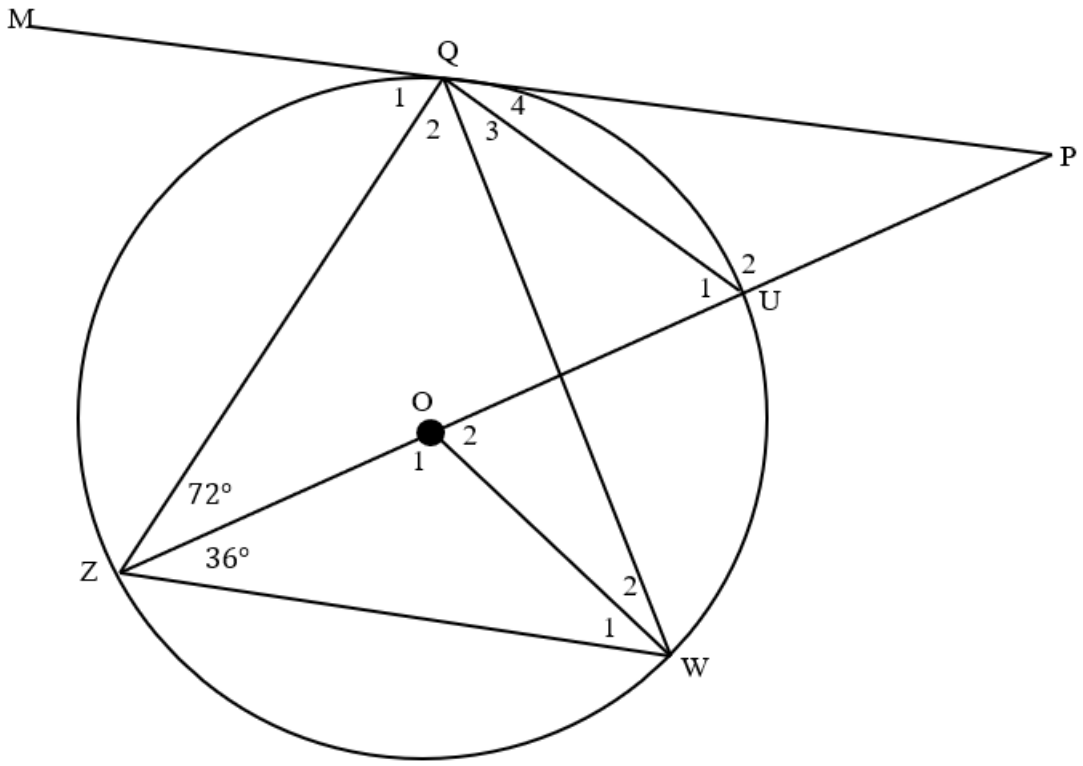
8.2.4 P_1 (2)

8.2.5 T_1 (2)
[23]

QUESTION 9

In the diagram below, O is the center of the circle and tangent MQP touches the circle at Q.

Diameter ZOU extended meets tangent MQP at P. QZO=72° and OZW=36° .



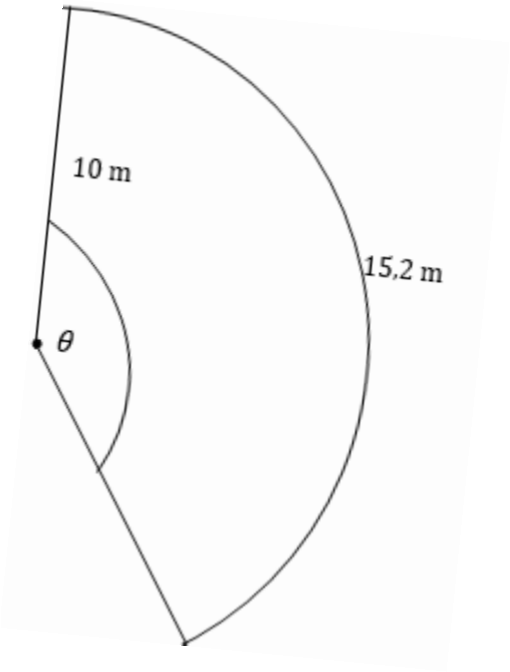
9.1 Q_4 (2)

9.2 Q_3 (2)

9.3 U_1 (4)
[8]

QUESTION 10

10.1 A yard is to be fenced into the shape of a sector of a circle.
The radius of the circle is 10 m and the arc length is 15,2 m.



10.1.1 Determine the central angle of the sector in radians. (3)

10.1.2 Determine the area of a sector. (3)

10.1.3 Fencing costs R101,27 per meter, how much will it cost to fence the whole yard? (3)

10.2 A wheel rotates at 20,5 m revolutions per second.

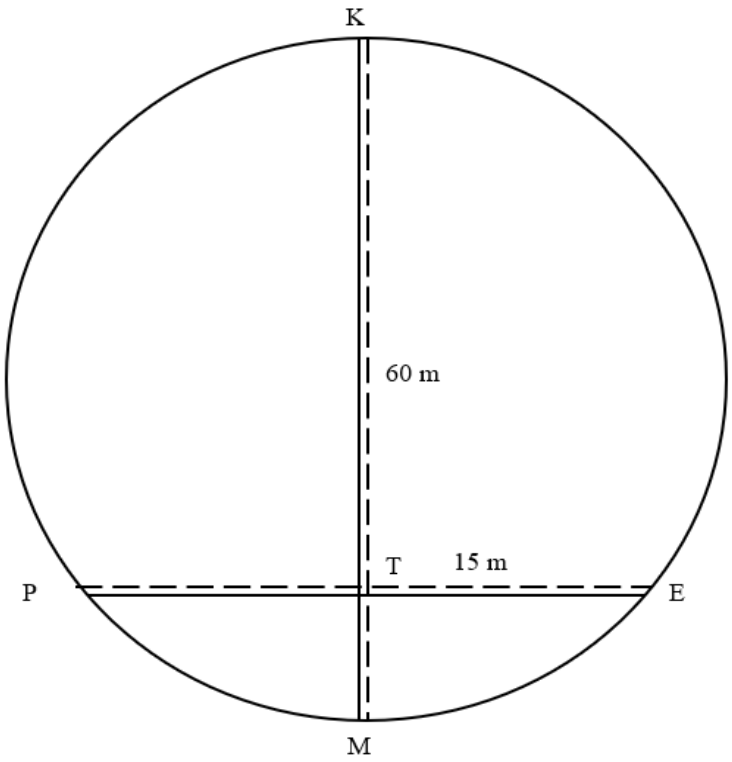
The diameter of the wheel is 150 mm.

10.2.1 Determine the angular velocity of the wheel. (3)

10.2.2 Calculate the circumferential velocity of the wheel, to the nearest integer. (3)

10.3 In the diagram below KM is the diameter of the circle with length 60 m.

PE is a chord of the circle with a length of 15 m.



Determine the height of the larger segment (KT). (7)

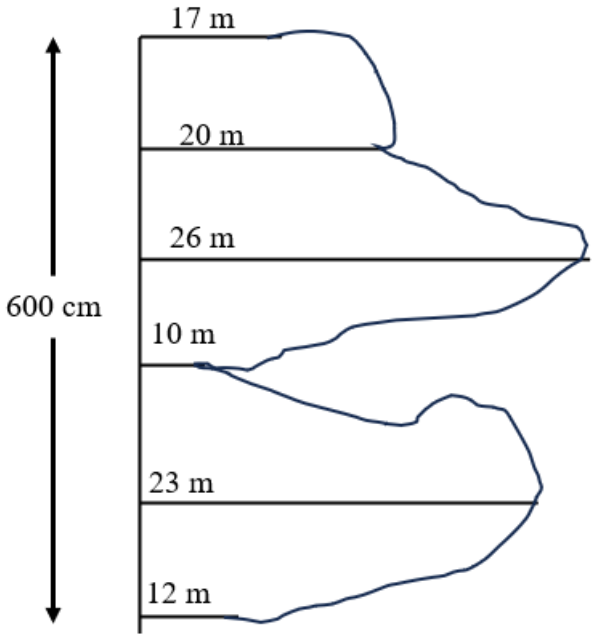
[22]

QUESTION 11

The irregular shape, as shown below, has one vertical straight side 600 cm long which is divided into five equal parts.

The ordinates dividing the parts are:

17 m; 20 m; 26 m; 10 m; 23 m; 12 m



11.1 Write down the length of equal parts in meters (m) (2)

11.2 Determine the area of the irregular shape by using the mid-ordinate rule. (4)

[6]

TOTAL: 150

INFORMATION SHEET: TECHNICAL MATHEMATICS

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

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

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

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

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

$$\int kx^n dx = \frac{kn^{n+1}}{n+1} + C \quad , n, k \in \mathbb{R} \text{ with } n \neq -1 \text{ and } k \neq 0$$

$$\int \frac{k}{x} dx = k \ln x + C \quad , x > 0 \text{ and } k \in \mathbb{R}; k \neq 0$$

$$\int ka^{nx} dx = \frac{ka^{nx}}{n \ln a} + C \ , a > 0, a \neq 1 \text{ and } k, a \in \mathbb{R}; k \neq 0$$

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

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

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

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $\qquad a^2 = b^2 + c^2 - 2bc.\cos A$

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

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

$\pi rad = 180°$

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 $\omega =$ angular velocity and $r =$ radius

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

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

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

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

OR

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