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KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

UGU DISTRICT

GRADE 12

MATHEMATICS

TASK 3: ASSIGNMENT

27^{TH} MAY 2025

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MARKS: 50

TIME: 1 hour

This question paper consists of 5 pages an information sheet, and a diagram sheet.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of **4** questions.
2. Answer ALL the questions.
3. Diagrams are not necessarily drawn to scale.
4. Clearly show ALL calculations, diagrams, et cetera that you have used in determining your answers.
5. Answers **ONLY** will not necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers to **TWO** decimal places, unless stated otherwise.
8. Write neatly and legibly.

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QUESTION 1

1.1 Given $f(x)=\dfrac{kx^2-1}{2}$, determine $f'(x)$ using first principles. (5)

1.2 Determine $\dfrac{dy}{dx}$ if $y=5\sqrt[3]{x^2}\left(2x-\dfrac{1}{2}x^{-3}\right)$ (5)

[10]

QUESTION 2

2.1 Given that:

- $f(x)=ax^3+bx^2+cx+d$
- $f'(-3)=0=f'(5)$
- $f(-3)=5$ and $f(5)=-3$
- f has three unequal roots

2.1.1 Sketch the graph of f showing clearly the turning points and the point of inflection. (4)

2.1.2 If $g(x)=f(x)+k$
Determine for which value(s) of k will g have one real root. (2)

2.2 Given : $f(x)=x^3-3x^2+3x-1$

Show that $f(x)$ is always increasing. (4)

2.3 If $h(x)$ is a linear function with $h(1)=5$ and $h'(3)=2$,

Determine the equation of $h(x)$ in the form $h(x)=mx+c$ (3)

[13]

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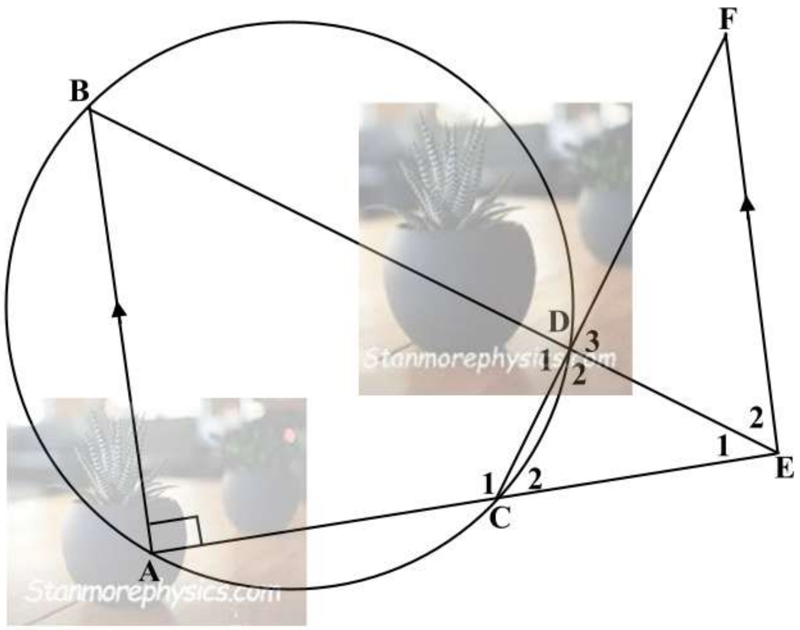
PLEASE PROVIDE REASONS FOR YOUR STATEMENTS IN QUESTIONS 3 AND 4

A diagram sheet is provided for your use, detach the diagram sheet and use it to work out questions 3 and 4.

QUESTION 3

In the diagram below, A, B, C, and D are points on the circumference of the circle. BD and AC produced meet at E. AB || EF and $\hat{A} = 90°$



3.1 Prove that $\Delta FEC \,|||\, \Delta EDC$ (4)

3.2 If $EC = 6$ units, $EF = 8$ units. Calculate the length of FD (5)

3.3 Hence, write down the ratio of $\dfrac{\text{area } \Delta EDC}{\text{area } \Delta EDF}$ (2)

3.4 Name TWO other triangles that are similar to ΔFEC (2)

[13]

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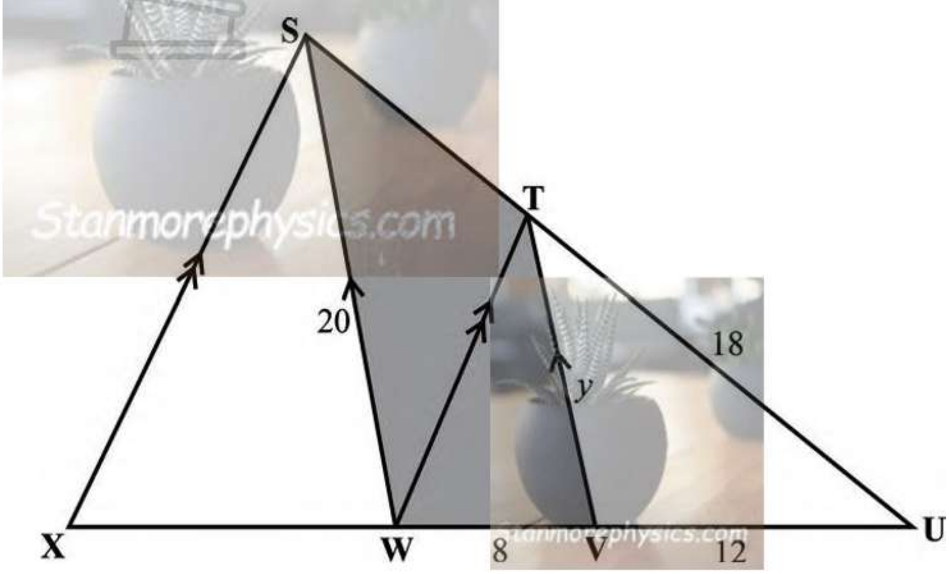
QUESTION 4

In the diagram, T is a point on side SU of ΔSXU
$TW \parallel SX$ and $TV \parallel SW$ with W and V on XU.
UT = 18 units , UV = 12 units , VW = 8 units and SW = 20 units.



Determine the following:

4.1 The length of XW. (5)

4.2 The ratio of $\dfrac{\text{area } \Delta SUW}{\text{area } \Delta TUV}$ (2)

4.3 The ratio of $\dfrac{\text{area } \Delta SXW}{\text{area } \Delta SWT}$ (4)

4.4 The length of TV (the value of y). (3)

[14]

TOTAL MARKS:50

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INFORMATION SHEET

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

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

$T_n=a+(n-1)d$ $\quad S_n=\frac{n}{2}[2a+(n-1)d]$

$T_n=ar^{n-1}$ $\quad S_n=\frac{a(r^n-1)}{r-1}\ ;\ r\neq 1$ $\quad S_\infty=\frac{a}{1-r}\ ;\ -1<r<1$

$F=\frac{x[(1+i)^n-1]}{i}$ $\quad P=\frac{x[1-(1+i)^{-n}]}{i}$

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

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

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

$(x-a)^2+(y-b)^2=r^2$

In ΔABC: $\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$

$a^2=b^2+c^2-2bc.\cos A$

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

$\sin(\alpha+\beta)=\sin\alpha.\cos\beta+\cos\alpha.\sin\beta$ $\quad \sin(\alpha-\beta)=\sin\alpha.\cos\beta-\cos\alpha.\sin\beta$

$\cos(\alpha+\beta)=\cos\alpha.\cos\beta-\sin\alpha.\sin\beta$ $\quad \cos(\alpha-\beta)=\cos\alpha.\cos\beta+\sin\alpha.\sin\beta$

$$\cos 2\alpha=\begin{cases}\cos^2\alpha-\sin^2\alpha\\ 1-2\sin^2\alpha\\ 2\cos^2\alpha-1\end{cases}$$

$\sin 2\alpha=2\sin\alpha.\cos\alpha$

$\bar{x}=\frac{\sum x}{n}$ $\quad \sigma^2=\frac{\sum_{i=1}^{n}(x_i-\bar{x})^2}{n}$

$P(A)=\frac{n(A)}{n(S)}$ $\quad P(A \text{ or } B)=P(A)+P(B)-P(A \text{ and } B)$

$\hat{y}=a+bx$ $\quad b=\frac{\sum(x-\bar{x})(y-\bar{y})}{\sum(x-\bar{x})^2}$

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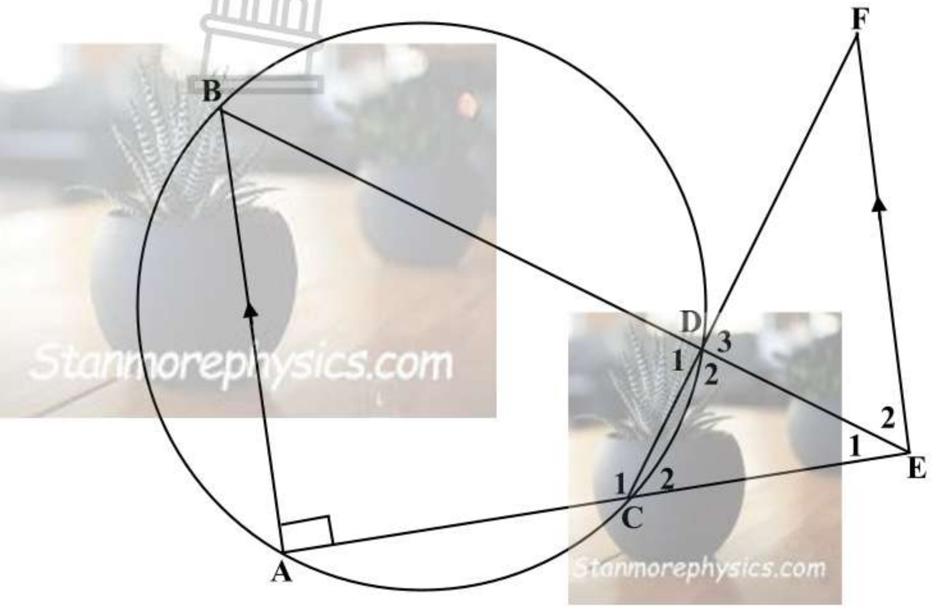
Diagram Sheet **Name: ______________________________________**

Question 3



Question 4