# KITEBI SECONDARY SCHOOL <br> BEGINNING OF TERM II EXAMINATIONS 2019 <br> S6 PURE MATHEMATICS <br> Paper One 3 <br> hours 

## INSTRUCTIONS

- Answer all questions in Section A and five questions from Section B.
- All working must be shown clearly and neatly.


## SECTION A

Answer all the eight questions in this section.

1. Find all the values of $x$ in the interval $180^{\circ} \square \square x \quad 540^{\circ}$ for which $\cot x \square 5 \operatorname{cosec} x^{2} \square 6$.
2. Find the equation of the circle whose diameter is the line joining the points $\mathrm{A}(2,1)$ and $\mathrm{B}(6,5)$.
(5 marks)
1
3. Using Binomial expansion, find the quadratic function that approximates to $f x \square \square \square$

values of $x$ close to zero. Hence evaluate $\sqrt[3]{\frac{64}{04 r r e c t ~ t o ~} 3 \text { decimal places. (5 marks) } 25}$
4. Given that $y \square$ In $\square_{x \square} \square_{x a^{2}} \square \square \square$ where $a$ is a constant, prove that: $\frac{d y}{d x} \square \frac{1}{\sqrt{x^{2} a^{2} \square^{2}}}$. Hence find $\frac{\overline{d y}}{d x^{2}}$.
5. Evaluate: $\left[\frac{x^{2}}{\sqrt{5}} \frac{\sqrt{x^{4} \square^{2}}}{} d x\right.$.
6. Find the vector equation of a line which passes through the point $\mathrm{A}(4,3,-2)$ and parallel to the vector $2 \mathbf{i}$ $+3 \mathbf{j}+4 \mathbf{k}$. Where does this line meet the line $x \square 0$ ?

From possible equations(s) whose roots are $\square$ and .
(5 marks) $y d y$

$$
y^{2} \square 1
$$

8. Solve the differential equation: $-\square_{2} \quad$, given that $y \square 3$ when $x \square 2$. ( $\mathbf{5}$ marks)

$$
x d x x \square 1
$$

## SECTION B

9. (a) Prove that:
$\frac{\sin 2 x \square \square 1 \cos 2 x}{21 \square \square \sin 2 x \square} \square \frac{1}{\tan x \square 1}$
(b) Solve for $x$ in:

(7 marks)
$12 \tan _{\square 1} x$.
10. (a) The first term of a geometrical progression, G.P is $\sqrt{3} \square 1$ and the sum of the first three terms is $33 \stackrel{\sqrt{1}}{\square} \square_{\square}$. Find the common ratio of the progression.
(b) Given that $U$ U $U_{1} \square_{2}$ and $U_{r \mid 1} \square \square_{2} \square_{2} \square^{5} \square$. Find the possible values of $U_{1}$.

Hence find the value of $\square U_{r \square 1}$ for each value of $U_{1}$
(7 marks)
 0. (7 marks) $\square$

1
(a) Evaluate $\square^{4} \longrightarrow d x$.

$$
{ }^{2} x \operatorname{In} x \square \square^{2}
$$

(b) Find $\square 2 e^{x} \sin \cos x x d x$.
13. (a) Vectors $\mathbf{a}=2 \mathbf{i}-2 \mathbf{j}-2 \mathbf{k}$ and $\mathbf{b}=\mathbf{i}-3 \mathbf{j}+2 \mathbf{k}$ form two sides of a triangle. Find its area. ( $\mathbf{5}$ marks)

14. (a) Use De Movires' theorem or otherwise to simplify:

$\cos -\square^{i \sin -}$
$\square \quad 2 \quad 2$ पロ
(b) If z is a complex number, find the Cartesian equation and illustrate the locus given by $z \mathrm{Z}$

(12 marks) z प प1 i 3
15. (a) Find the locus of point P which moves such that the sum of its distance from $(2,0)$ and $(-2,0)$ remains equal to $2 \sqrt{5}$.
(b) Find the equation of the normal at $R a \square \cos , \square \square b s i n \square$ to an ellipse $b x^{22} \square a y^{22} \square a b^{22}$. If the normal at R to the ellipse meets the x - axis at S . find the area of triangle ROS. ( $\mathbf{1 2}$ marks)
16. (a) Using small changes, evaluate 32 .
(b) Water starts running into an empty vessel at a rate of $6 \square \mathrm{~cm}^{3} / s$. The vessel is in the shape of the surface formed when the curve $4 y x \square^{2}$ is rotated completely about the $y \square a x i s$. Show that when the depth of the water in the vessel is $2 \square y \mathrm{~cm}^{2} \quad{ }^{3}$.
Find the rate at which the water level is rising when the water has been running for 3 seconds.

