P425/1
PURE MATHEMATICS
PRE-MOCK
JUNE/JULY 2024
*3 HOURS*

# JOURNEY OF SUCCESS EXAMINATIONS BOARD

## Uganda advanced certificate of education

**PRE-MOCK EXAMINATIONS**
**PURE MATHEMATICS**
**Paper 1**
3 HOURS

**INSTRUCTIONS TO CANDIDATES**

- *Answer **all the eight** questions in section **A** and any **five** from section **B**.*
- *Any additional question(s) will **not** be marked.*
- *All working **must** be shown clearly.*
- *Begin each question on a fresh sheet of paper.*
- *Silent, non-programmable scientific calculators and mathematical tables with a list of formulae may be used.*

## SECTION A (40 MARKS)

***Answer all questions in this section***

**1.** In an A.P the sum of the first 10 terms is 520 and the 7th term doubles the 3rd term. Find the first term *a* and common difference (*d*) **(05 marks)**

**2.** show that; $\frac{1 + \tan 60^o}{1 - \tan 60^o} = -(2 + \sqrt{3})$ **(05 marks)**

**3.** Determine the co-ordinates of the turning points of the curve $y = (x - 1)\sqrt{(2x + 2}$. **(05 marks)**

4. Prove by induction that; $\frac{1}{2} + \frac{1}{6} + \cdots .. \frac{1}{n(n+1)} = \frac{n}{n+1}$ **(05 marks)**

**5.** Given the circle; $\mathbf{2x^2 + 2y^2 - 6x + 8y = 0}$ **(05 marks)**

6. Find $\frac{dy}{dx}$ in terms of *t* in the expressions $x = \sin^2 t$ and $y = \cos^2 2t$ and hence show that $\frac{d^2y}{dx^2} = 8$ **(05 marks)**

7. Find the cube root of; $i - \sqrt{3}$. **(05 marks)**

8. Find the volume of the solid generated by rotating about the x-axis the area under $y = \frac{3}{4}x$ from $x = 0$ to $x = 4$. **(05 marks)**

## SECTION B (60 MARKS)

***Answer any five questions from this section. All questions carry equal marks***

9 a) Solve for t where cost + sint = sect for $0 \leq t \leq 360°$ **(04 marks)**

b) show that; $2tan^{-1}2 + tan^{-1}3 = \pi + tan^{-1}\frac{1}{3}$ **(04 marks)**

c) Without using tables or calculator, evaluate tan195° **(04 marks)**

10 a) Sketch the locus of a point P which is represented by$|z + 2 + 2i| < 2|z + 1|$ and show the required region **(07 marks)**

b) Solve for x and y $\frac{x}{2+3i} - \frac{y}{3-2i} = \frac{6+2i}{1+8i}$ **(05 marks)**

11. a) Prove that $\int_0^2 \frac{2x-1}{(2x+1)(x+1)^2} dx$ **(06 marks)**

b) Show that; $\int_0^\infty e^{-2x} sin3x \, dx = \frac{3}{13}$ **(06 marks)**

12. a) Obtain the first four terms of the expansion of $(1+\frac{1}{2}x)^8$ in ascending powers of x.

Hence find the value of $(1.004)^8$, correct to four decimal places **(06 marks)**

b) Use the Binomial theorem to expand $\sqrt{\frac{(2-x)}{(2+x)}}$ up to $x^3$ (keep 2 decimal points)

**(06 marks)**

13. Given the curve; $y = \frac{2x^2-9x+4}{x^2-2x+1}$.

a) Show the turning points of the curve **(04 marks)**

b) State the asymptotes **(02 marks)**

c) Hence sketch the curve **(06 marks)**

14 a) Find the perpendicular distance of the point P(0, 7, 5) from the line whose

equation is r = (i+2j- 3k) 4- μ(3i+4k).. **(04 marks)**

b) The points A and B have coordinates (2, 1, 1) and (0, 5, 3) respectively. Find the equation of the line AB in terms of a parameter. If C is the point (5, —4, 2)

i) Find the coordinates of the point D on AB such that CD is perpendicular to AB

ii) Find the equation of the plane containing AB and perpendicular to the line CD

**(04 marks)**

15. a) Determine the equation of the circle with the parametric equations $x = 1 - \sin\theta$ and $y = 1 + \cos\theta$. **(04 marks)**

b) Given the parabola $y^2 = 4ax$, determine the point of intersection of the two normas at

P(6,12) and at point Q( $\frac{49}{6}$, 13) **(06 marks)**

16 a) solve the differential; $\frac{dy}{dx} + 4y = e^{3x}$. When x is 0.5 and y is 2 **(06 marks)**

b) In an established forest fire, the proportion of the total area of the forest which has been destroyed is denoted by x, and the rate of change of x with respect to time, t hours, is called the destruction rate. Investigations show that the destruction rate is directly proportional to (x-1). A particular fire is initially noticed when a quarter of the forest is destroyed, and half of the forest was destroyed after 2 hours.
Determine the quantity of the remaining forest after 4 hours **(06 marks)**

**END**