NAME……..……..STREAM…..……GROUP……

KING'S COLLEGE, BUDO

END OF TERM III EXAMINATIONS

S.5 MATHEMATICS−P425/1

PAPER **1**

3 HOURS

INSTRUCTIONS

- *Answer* **all** *the questions in section* **A** *and any* **five** *from section* **B.**
- *Write your* **name** *and* **stream** *on every answer sheet used.*
- *All working* **MUST** *be logically shown.*
- *Any additional question(s) answered will* **NOT** *be marked.*

	SECTION A								**SECTION B**					
QNS	1	2	3	4	5	6	7	8						**TOTAL**
MKS														

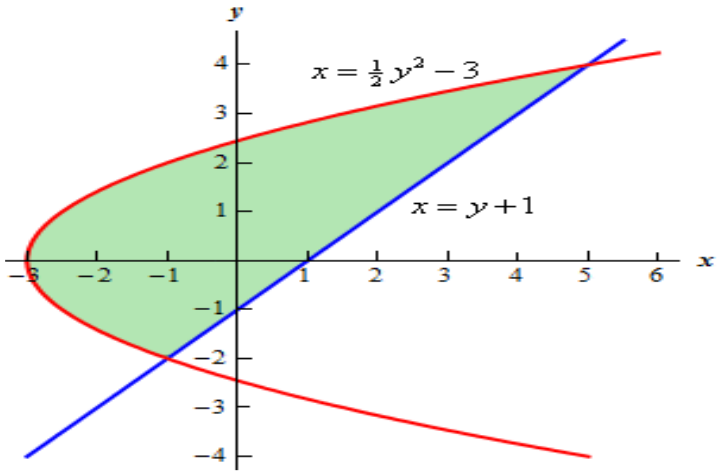
SECTION A: (40 MARKS)

1. Solve the equation $3\sqrt{t} - \sqrt{(t+5)} = 3$. (05 marks)

2. If $y = ae^{-2x}sin(x+\beta)$ where a and β are constants, prove that
$\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 5y = 0$. (05 marks)

3. Show that $\tan^{-1}\left(\frac{x-y}{1+xy}\right) + \tan^{-1}\left(\frac{y-z}{1+yz}\right) = \tan^{-1}\left(\frac{x-z}{1+xz}\right)$. (05 marks)

4. Find the area enclosed by the curve $x = \frac{1}{2}y^2 - 3$ and the line $x = y + 1$ below:



5. Find $\int e^x \cos x \ dx$. (05 marks)

6. How many terms of the series 1+8+15+… are required to give a sum of 5500? (05 marks)

7. If A is the point $(2, 0)$ and B is the point $(-3, 0)$, find the locus of a point P which moves so that $AP^2 + 2BP^2 = 22$. (05 marks)

8. Find the values of x and y in $\frac{x}{2+3i} - \frac{y}{3-2i} = \frac{6+2i}{1+8i}$. (05 marks)

SECTION B: (60 MARKS)

9. (a) If $\sin(x + \alpha) = 2\cos(x - \alpha)$, prove that $\tan x = \frac{2-\tan\alpha}{1-2\tan\alpha}$. Hence solve $\sin(x + 45) = 2\cos(x - 45)$ for $-2\pi \leq x \leq 2\pi$.

(b) Find the maximum and minimum values of $3\sqrt{2}\cos(\theta + 45^0) + 7\sin\theta$ by expressing in the form $R\cos(\theta - \alpha)$. State the smallest values of θ for which they occur. (12 marks)

10. A curve has the equation $y = \frac{x^2-4x}{x^2-4x+3}$

(i) Determine the nature of the turning point on the curve.

(ii) Determine the equations of the asymptotes of the curve.

(iii) Sketch the curve. (12 marks)

11. (a) Use the substitution $u = e^{2t}$ to find $\int \frac{e^{2t}}{1+e^{4t}} dt$.

(b) Evaluate $\int_0^1 \frac{3y-1}{y^2+3y+2}\, dy$ correct to 4 decimal places. (12 marks)

12. (a) Find the equation of the tangent to the curve $\frac{x^3-y}{1-y^3} = x$ at the point $(1, -1)$.

(b) Differentiate the following with respect to x

(i) $(\tan^{-1} x)^{x^2}$ (ii) $\left(\frac{x-2}{x^2-3}\right)^3$. (12 marks)

13. (a) The roots of the equation $ax^2 + bx + c = 0$ are α and β.

(i) Find the values of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ and $(\alpha - \beta)^2$.

(ii) Express $\frac{c}{b}$ in terms of α and β.

(b) The polynomial $x^4 + ax^3 + bx^2 + bx - 12$ is divisible by both $(x - 2)$ and $(x + 2)$. Find the values of a and b. (12 marks)

14. (a) Prove that $\log_q p = \frac{\log_r p}{\log_r q}$. Hence given that $\frac{\log_{10} 3}{\log_{10} 2} = \frac{8}{5}$ evaluate $(\log_3 2)^2$.

(b) Find x in the equation $\log_2 x - \log_x 8 + 2 = 0$.

(c) Simplify $\frac{\log 81}{\log 3} - \frac{\log 9}{\log 27}$. (12 marks)

15. (a) Given that $y = \ln(x^2 + x + 2)$, find the Maclaurin's expansion of y up to the third term. Hence estimate $\ln 2.11$ truncated to 4 significant figures.

(b) The coefficient of x^2 in the expansion of $(1 - 2x)^n$ is 24. Calculate the value(s) of n. (12 marks)

16. (a) Find the Cartesian equation of the locus of a point P represented by the equation $\left|\frac{z+2-i}{z-1}\right| = 2$.

(b) Solve the equation $z^3 + 8 = 0$. (12 marks)

−END−

SUCCESS