HARRISON COLLEGE INTERNAL EXAMINATION MARCH 2019
CARIBBEAN ADVANCED PROFICIENCY EXAMINATION
SCHOOL BASED ASSESSMENT
PURE MATHEMATICS
UNIT I – PREVIEW TEST 2
1 hour 20 minutes

This examination paper consists of 2 printed pages.
This paper consists of **6** questions.
The maximum mark for this examination is **60**.

INSTRUCTIONS TO CANDIDATES
(i) Write your name clearly on each sheet of paper used
(ii) Answer **ALL** questions
(iii) Number your questions identically as they appear on the question paper and do **NOT write your solutions to different questions** beside each other
(iv) Unless otherwise stated in the question, any numerical answer that is not exact, **MUST** be written correct to three (3) significant figures

EXAMINATION MATERIALS ALLOWED
(a) Mathematical formulae
(b) Scientific calculator (non-programmable, non-graphical)

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1) Prove that $\frac{\cos A - \sin A}{1 - \tan A} \equiv cos\ A$ [5]

2) (i) Prove that $\frac{\sin A + \sin 5A}{2cos\ 2A} \equiv \sin 3A$. [4]

(ii) Hence, find the general solution of the equation $\frac{\sin A + \sin 5A}{2cos\ 2A} = 1$. **Ans.** $\frac{n\pi}{3} + (-1)^n \frac{\pi}{6}$ [4]

3) (i) Express $3sin\ x - cosx$ in the form $\boldsymbol{R}sin(x - \alpha)$, where $\boldsymbol{R} > 0$ and $0 \leq \alpha \leq \frac{\pi}{2}$, giving the exact value of $\boldsymbol{R}$, and the value of α correct to 3 decimal places. **Ans.** $\sqrt{10}, 0.322^c$ [6]

(ii) Hence, solve the equation $3sin\ x - cosx = \frac{\sqrt{3}}{2}$ for $0 \leq x \leq 2\pi$, giving your answers correct to 3 decimal places. **Ans.** 0.599^c, 3.187^c [6]

4) Find, in exact form, the coordinates of the points of intersection of the two circles

$x^2 + y^2 + 8x + 2y - 22 = 0$ and $x^2 + y^2 - 6x + 4y + 2 = 0$. [7]

Ans. $(\frac{73 \pm \sqrt{429}}{50}, \frac{-89 \pm 7\sqrt{429}}{50})$

5) (a) (i) A curve, *C*, is defined parametrically by the equations

$x = 7\sin\theta - 5$ and $y = 7\cos\theta + 2$. **Ans.** $(x + 5)^2 + (y - 2)^2 = 49$ [4]

(ii) Describe fully, the locus of *C*. **Ans.** circle, centre (-5, 2), radius 7 [3]

(b) A line, ***l***, passes through the point $\boldsymbol{P}(-5, 8, -3)$ and is parallel to the vector $-4\boldsymbol{i} - 7\boldsymbol{j} + 3\boldsymbol{k}$.

Find, for the line ***l***

(i) its vector equation **Ans.** $\boldsymbol{r} = -5\boldsymbol{i} + 8\boldsymbol{j} - 3\boldsymbol{k} + \lambda(-4\boldsymbol{i} - 7\boldsymbol{j} + 3\boldsymbol{k})$ [2]

(ii) its cartesian equations **Ans.** $\frac{x+5}{-4} = \frac{y-8}{-7} = \frac{z+3}{3}$ [3]

(c) Find the angle, correct to 1 decimal place, between the lines with equations

$\boldsymbol{r} = 2\boldsymbol{i} - 5\boldsymbol{j} + 3\boldsymbol{k} + \lambda(-3\boldsymbol{i} + 2\boldsymbol{j} - 5\boldsymbol{k})$ and $\boldsymbol{r} = -4\boldsymbol{i} + 6\boldsymbol{j} - \boldsymbol{k} + \mu(5\boldsymbol{i} - 4\boldsymbol{j} + 2\boldsymbol{k})$ **Ans.** 37.1^0 [5]

6) A plane contains three non-collinear points $\boldsymbol{A}(-4, -8, 3)$, $\boldsymbol{B}(2, -7, 4)$ and $\boldsymbol{C}(-3, 5, -1)$

(i) Prove that the vector $-17\boldsymbol{i} + 25\boldsymbol{j} + 77\boldsymbol{k}$ is normal to the plane [5]

(ii) Hence, obtain the Cartesian equation of the plane. **Ans.** $-17x + 25y + 77z = 99$ [3]

(iii) Find the perpendicular distance of the plane from the origin. **Ans.** $\frac{99}{\sqrt{6843}}$ [3]

END OF TEST