BHASVIC MαTHS

A2 Doubles assignment *summer 5*

Section: *FP1*

<u>Past</u>

1)

Find the coordinates of all the stationary points
on the curve $x^2 + y^2 + xy = 3$.

2)

(i) Express $\cos\theta + \sqrt{2}\sin\theta$ in the form
$r\cos(\theta - \alpha)$, where $r > 0$ and
$0° < \alpha < 90°$.

(ii) State the maximum and minimum values
of $\cos\theta + \sqrt{2}\sin\theta$ and the smallest
positive values of θ for which they occur.

(iii) Sketch the graph of $y = \cos\theta + \sqrt{2}\sin\theta$
for $0° \leqslant \theta \leqslant 360°$.

(iv) State the maximum and minimum values
of
$$\frac{1}{3 + \cos\theta + \sqrt{2}\sin\theta}$$
and the smallest positive values of θ for
which they occur.

3)

OABC is a rectangle. With respect to the origin, O, the position vectors of **a**
and **b** are $2\mathbf{i} - 3\mathbf{j} + 5\mathbf{k}$ and $s\mathbf{i} + 3\mathbf{j} + 7\mathbf{k}$ respectively.

a   Find the value of s.

b   Find vector equations for the diagonals AC and OB.

c   Find the cosine of the acute angle between these diagonals.

4)

A cave has a planar roof passing through the points $(0, 0, -19)$, $(5, 0, -20)$ and $(0, 5, -22)$.
A tunnel is being bored through the rock from the point $(0, 3, 4)$ in the direction
$-\mathbf{i} + 2\mathbf{j} - 20\mathbf{k}$. Find in degrees, correct to the nearest degree, the angle between the tunnel
and the cave roof.

(Lots of repetition but there are loads of variations of these questions that you need to be good at). Remember to check your answers on the graphics calculator too using G-Solv to find the intersections.

5)

Solve the following inequalities:

(i) $\quad |x+2| < 4$

(ii) $\quad |3x+1| \geq 2x+3$

6)

Solve the inequality $|3x-2| \geq 2|x-1|$

7)

Use any appropriate method to solve the following inequalities:

$$\frac{(x-1)(x-2)}{(x-3)(x-4)} > 1$$

8)

$$\frac{1}{x^2} < \frac{1}{x+2}$$

9)

$$\left|\frac{3x-2}{x-1}\right| \geq 1$$

10)

Sketch the curve $y = \dfrac{x-1}{x+2}$ and use this to help solve the inequality

$0 \leq \dfrac{x-1}{x+2} \leq 2$ for x.

11)

(a) Find the set of values of x for which

$$x+4 > \frac{2}{x+3}$$

(6)

(b) Deduce, or otherwise find, the values of x for which

$$x+4 > \frac{2}{|x+3|}$$

(1)

12)

The curves C_1 and C_2 have respective equations

$$y = \frac{1}{x}, \quad x \in \mathbb{R}, \quad x \neq 0, \qquad \text{and} \qquad y = \frac{x}{x+2}, \quad x \in \mathbb{R}, \quad x \neq -2.$$

a) Sketch in the same set of axes the graph of C_1 and the graph of C_2.

Indicate clearly in the sketch …

- … the equations of any asymptotes.

- … the coordinates of any intersections between each curve with the coordinate axes.

b) Find the coordinates of the points of intersection between the graph of C_1 and C_2, and hence solve the inequality

$$\frac{1}{x} \geq \frac{x}{x+2}.$$