Year 2 **Pure Mathematics Examination Revision : Health Check N° 10**

Why did the banana go to the doctor ?
It wasn't peeling well !

Any solution based entirely on graphical
or numerical methods is not acceptable

Marks Available : 34

Question 1

(i) Simplify,

$$\log_4 x + 2\log_4 y - \log_4 (xy)$$

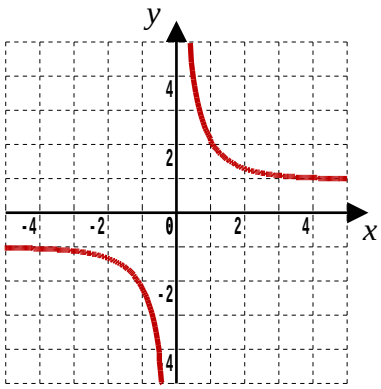
[2 marks]

(ii) Hence, or otherwise, solve the following, finding the exact value of y;

$$\log_4 x + 2\log_4 y - \log_4 (xy) = 7$$

[2 marks]

Question 2



The graph is of the function, $f(x) = \dfrac{e^x + 1}{e^x - 1} \quad x \in \mathbb{R},\ x \neq 0$

(i) Determine the exact value of $f(ln\, 3)$

[2 marks]

(ii) Find the inverse function, $f^{-1}(x)$

[4 marks]

(iii) With the help of the graph, state the domain of the inverse function.

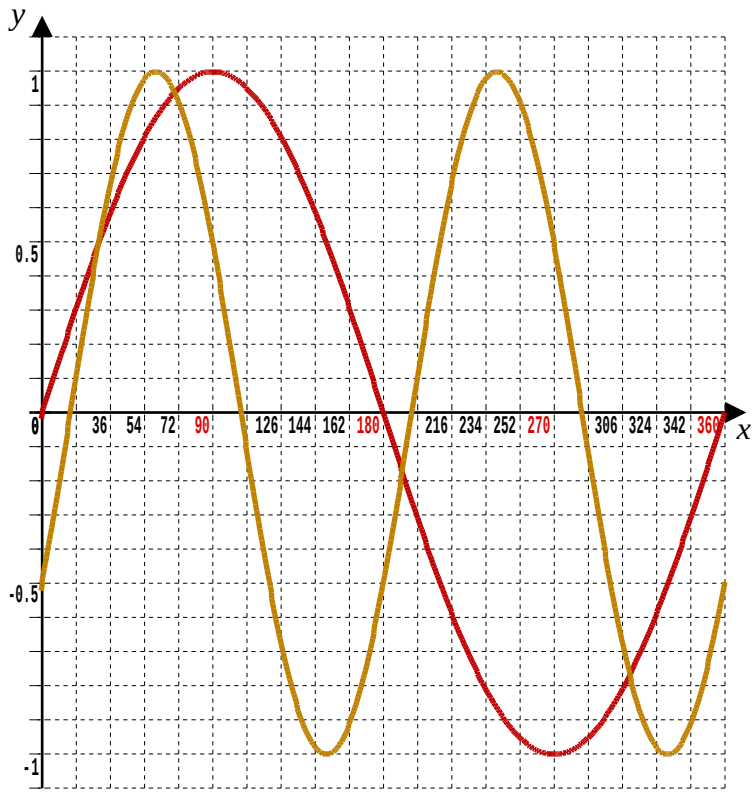
[2 marks]

Question 3

The two functions that are graphed below are,

In red: $f(x) = \sin x$ $\qquad 0 \leqslant x \leqslant 360°$

In gold: $g(x) = \sin(2x - 30°)$ $\qquad 0 \leqslant x \leqslant 360°$



(i) From the graph, how many solutions are to be expected from solving the equation, $g(x) = f(x)$, $0 \leqslant x \leqslant 360°$

[1 mark]

(ii) Solve the equation $g(x) = f(x)$, $0 \leqslant x \leqslant 360°$

[5 marks]

Question 4

The following four points for a quadrilateral *ABCDA* in 3 dimensional space;

- $A(2, \quad 7, -3)$
- $B(8, -3, \quad 5)$
- $C(4, \quad 0, -3)$
- $D(7, -5, \quad 1)$

(i) Find $\overrightarrow{AB}$

[2 marks]

(ii) Show that quadrilateral *ABCDA* is a trapezium.
Give reasons for your answer.

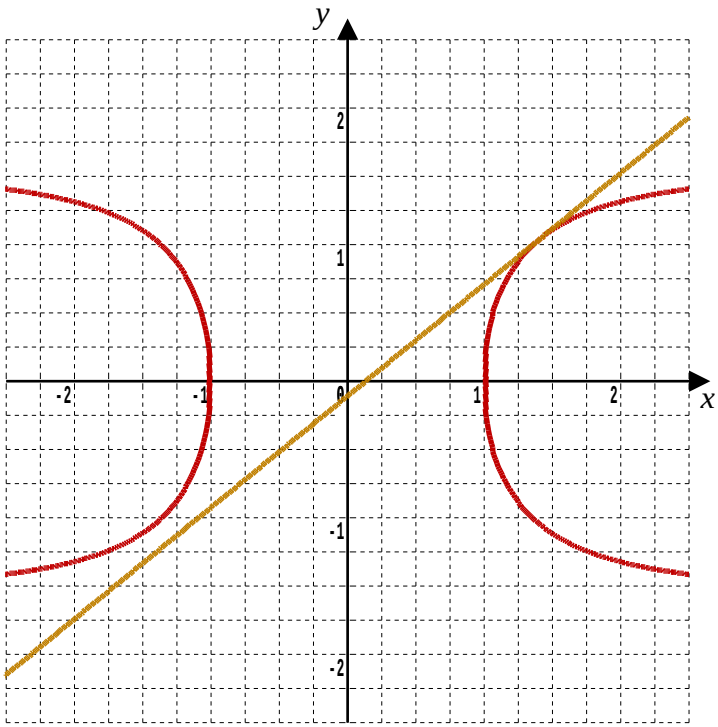
[3 marks]

(iii) Show that quadrilateral *ABCD* is not a parallelogram.
Give reasons for your answer.

[3 marks]

Question 5

The red curve in the graph below is of the equation, $x^2 \cos y = 1$



Find the (exact) equation of the tangent (shown in gold) to the curve when $y = \frac{\pi}{3}$

[8 marks]