## Year 1 Pure Mathematics Examination Revision

## Health Check $\mathbf{N}^{\circ} 2$

## Hately

I went to the Library to get a medical book on abdominal pain. Somebody had ripped the appendix out...

Any solution based entirely on graphical<br>or numerical methods is not acceptable<br>Marks Available : 50

## Question 1

Given a curve, $y=f(x)$, if $y$ is replaced with $\frac{y}{3}$ all distances from the $x$-axis are tripled and if $x$ is replaced with $2 x$ all distances from the $y$-axis halve.

Use these facts to sketch the graph of $\frac{y}{3}=\sin (2 x)$ on the grid below.


## Question 2

(i) Show that $\frac{1-\tan ^{2} x}{1+\tan ^{2} x}=2 \cos ^{2} x-1$
(ii) Hence solve $\frac{1-\tan ^{2} x}{1+\tan ^{2} x}=\frac{1}{8}$ over the interval $0^{\circ} \leqslant x \leqslant 360^{\circ}$

## Question 3

(i) On the same graph sketch the curve $y=(x-1)^{2}(x+1)^{2}$ and the straight line $y=1$, paying particular attention to any points where an axis is touched or crossed.
[ 5 marks ]
(ii) Find all solutions to the equation, $(x-1)^{2}(x+1)^{2}=1$
[ 4 marks ]
(iii ) Solve $\left(\frac{1}{\cos x}-1\right)^{2}\left(\frac{1}{\cos x}+1\right)^{2}=1,0 \leqslant x \leqslant 360, x \neq 90,270$

## Question 4

To translate any curve by the vector $\binom{a}{b}$

- replace $x$ with $x-a$
- replace $y$ with $y-b$
(i) Given that the equation of a circle centre ( 0,0 ), radius $r$ is $x^{2}+y^{2}=r^{2}$ deduce the equation of a circle of radius 13 that has been translated $\binom{5}{12}$
(ii) The parabola $y=x^{2}$ is to be translated $\binom{4}{-7}$

What is the equation of the translated parabola?
Give your answer in the form $y=a x^{2}+b x+c$ where $a, b$ and $c$ are integers the values of which you have determined.
( iii ) The inverse proportion graph, $y=\frac{1}{x}$ is translated so that the asymptotes are at $x=5$ and $y=1$.
Find the equation of the transformed graph in the form $y=\frac{a x+b}{c x+d}$ where $a, b, c$ and $d$ are integers, the values of which you have determined.

## Question 5

In $\triangle A B C, A B=16 \mathrm{~cm}, A C=13 \mathrm{~cm}, \angle A B C=50^{\circ}$ and $\angle B C A=x^{\circ}$
Find the two possible values for $x$, giving your answers to one decimal place.

## Question 6

The parabola shown below crosses the $x$-axis at $(-5,0)$ and (4, 0) and it crosses the $y$-axis at $(0,-5)$

(i) Determine the equation of the parabola in the form $y=f(x)$
[ 4 marks ]
(ii ) Solve the related equation $f(x-3)=0$

