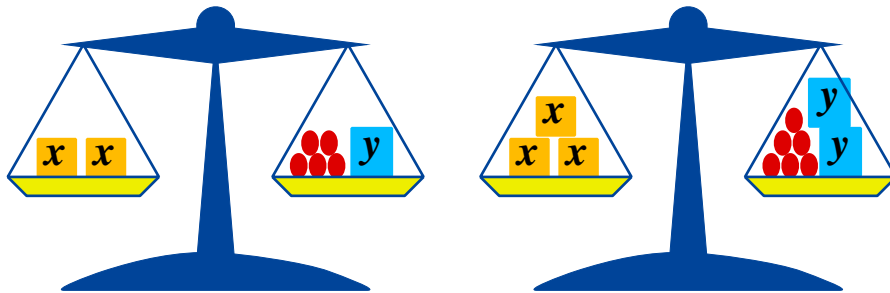


Lesson 2

GCSE Mathematics Methods of Solving Equations

2.1 An Advanced Initiative Test

As part of an advanced initiative test Monty is shown two set of scales which are in balance. His challenge is to, without touching anything, figure out how many red balls a block marked x would balance and how many red balls a block marked y would balance.



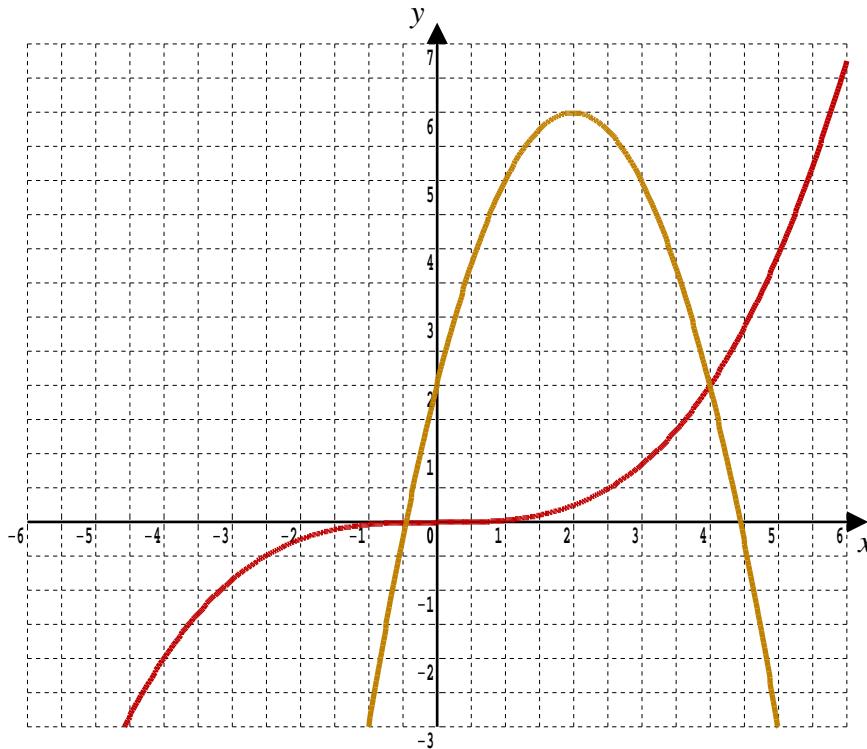
Monty may need your help because the clock is ticking...



[6 marks]

2.2 Graphical Simultaneous Equations

Once again, although we'd like to solve our simultaneous equations using algebra, this may become too difficult. One alternative method is to use a graph plotter on a computer or on a graphics calculator to graph the equations. It is then a question of looking at where the two graphs intersect each other.



In red is the graph of the equation,

$$y = \frac{x^3}{32}$$

In gold is the graph of the equation,

$$y = 2 + 4x - x^2$$

(i) Solve these two equations simultaneously.

[4 marks]

(ii) Suggest two disadvantages of the graphical method of solving these simultaneous equations.

[4 marks]

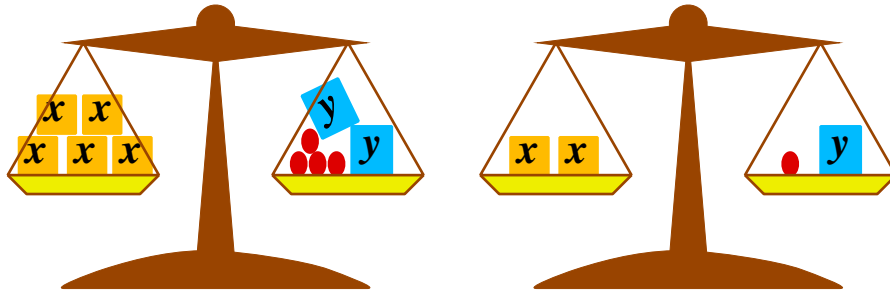
2.3 Exercise

You may use a calculator

Marks Available : 50

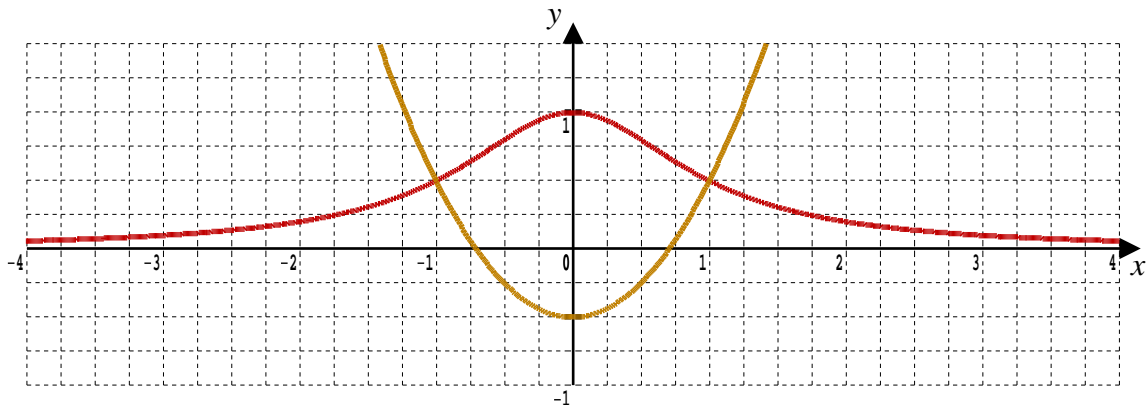
Question 1

Two set of scales are shown in the diagram, both of which are in balance. With how many red balls will a block marked x balance and with how many red balls will a block marked y balance ?



[6 marks]

Question 2



The graph plotted in red is of the curve, $y = \frac{1}{(1+x^2)}$

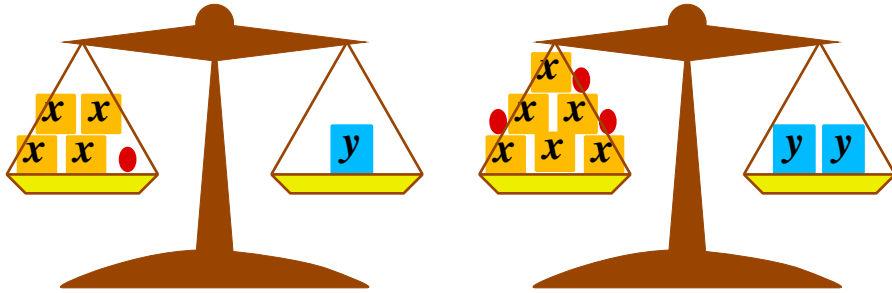
The graph plotted in gold is of the curve $y = x^2 - \frac{1}{2}$

Solve these two equations simultaneously.

[4 marks]

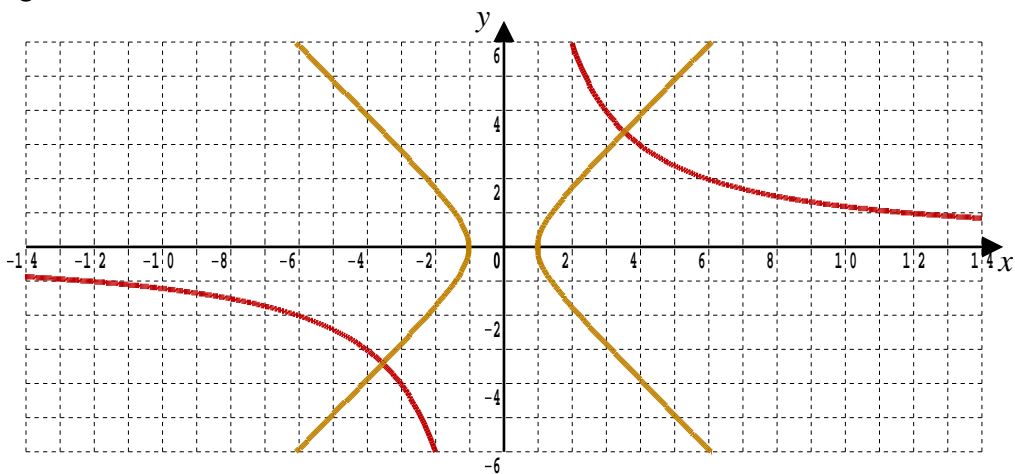
Question 3

Two set of scales are shown in the diagram, both of which are in balance. With what fraction of a red ball will a block marked x balance and with how many red balls will a block marked y balance ?



[6 marks]

Question 4



The graph plotted in red is of the curve, $y = \frac{12}{x}$

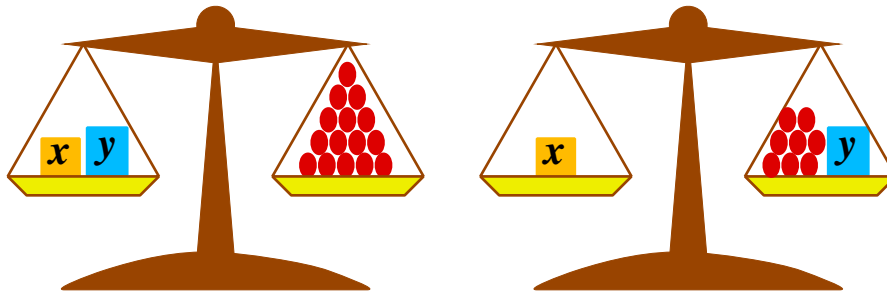
The graph plotted in gold is of the curve $y^2 - x^2 = 1$

Solve the two equations simultaneously giving your answers to 1 decimal place.

[4 marks]

Question 5

Two set of scales are shown in the diagram, both of which are in balance. Against how many red ball will a block marked x balance and with how many red balls will a block marked y balance ? The answers are not integers.



[6 marks]

Question 6

Hamish is trying to solve simultaneously $y = x^3 + 3x + 1$ and $y = 4x^2 + 1$. He has decided to do this by constructing the following spreadsheet,

$x^3 + 3x + 1$	x	$4x^2 + 1$
1	0	1
5	1	5
	2	
	3	
77	4	

(i) Fill in the five empty cells in the spreadsheet.

[4 marks]

(ii) From looking at the filled in spreadsheet, write down the two values of x that satisfy the two equations simultaneously.

[2 marks]

(iii) If the two equations were plotted separately on a graph what would be the two points of intersection ?

[2 marks]

Question 7



The graph plotted in red is of the curve, $y = \frac{24}{x^2 - 1}$

The graph plotted in gold is of the curve $y = x^2$

- (i) By carefully looking at the graph, write down the value of x correct to 1 decimal place, that satisfies these two equations simultaneously.

[2 marks]

Toby wants to find the value of x that satisfies the two equations more accurately. Here is a printout of the spreadsheet he has made to do this,

$y = \frac{24}{x^2 - 1}$	x	$y = x^2$
5.594	2.30	5.290
5.535	2.31	5.336
5.476	2.32	5.382
5.412	2.33	5.429
5.362	2.34	5.476
	2.35	
5.252	2.36	5.570

- (ii) Fill in the two empty cells in Toby's spreadsheet.

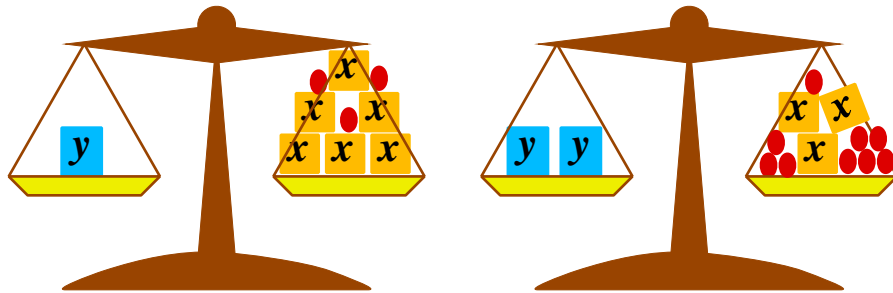
[4 marks]

- (iii) By carefully looking at the spreadsheet, write down the value of x correct to 2 decimal places, that satisfies the two equations simultaneously.

[4 marks]

Question 8

Two set of scales are shown in the diagram, both of which are in balance. With what fraction of a red ball will a block marked x balance and with how many red balls will a block marked y balance ?



[6 marks]