

Examples taken from the bank of specimen questions

Paper 1, question 4

Bob invests 600 euros in a bank that offers a rate of 2.75% compounded annually.

- Calculate how much money Bob has in the bank after 4 years.
- Calculate the number of years it will take for the investment to double.

Ann invests 600 euros in another bank that offers interest compounded annually. Her investment doubles in 20 years.

- Find the rate that the bank is offering.

The student should use the calculator mode and either the table of values or "Finance".

(a)

- Input $Y1 = 600(1 + 2.75/100)^x$.

X	Y1
3.8	665.15
3.9	666.96
4.0	668.77
4.1	670.59
4.2	672.41
4.3	674.24
4.4	676.07

X=4

N=4
I%=2.75
PV=-600
PMT=0
FV=668.7727556
P/Y=1
C/Y=1
PMT: [] BEGIN

Student's answer:

$$600(1 + 2.75/100)^4 = 668.77.$$

(b)

- Scroll down the table until the value 1200 appears for y.

X	Y1
25.5	1198.4
25.6	1201.6
25.7	1204.9
25.8	1208.2
25.9	1211.4
26	1214.7
26.1	1218

X=25.6

N=25.55035862
I%=2.75
PV=-600
PMT=0
FV=1200
P/Y=1
C/Y=1
PMT: [] BEGIN

The first value is 25.6, therefore the answer is: 26 years.

Student's answer:

$$600(1 + 2.75/100)^n = 1200$$

$$n = 26.$$

(c)

- The answer cannot be found using tables. The student must use "Finance".

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N=20
I%=3.526492384
PV=-600
PMT=0
FV=1200
P/Y=1
C/Y=1
PMT: [ ] BEGIN
    
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Student's answer:

$$600(1 + r/100)^{20} = 1200$$

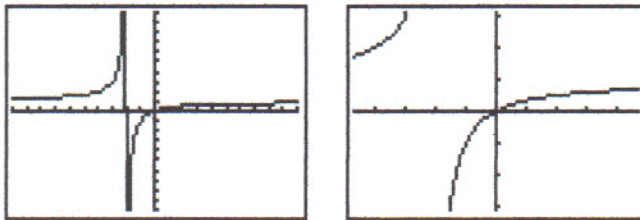
$$r = 3.53\%.$$

Paper 1, question 11

- (a) Sketch a graph of $y = \frac{x}{2+x}$ for $-10 \leq x \leq 10$.
- (b) Hence write down the equations of the horizontal and vertical asymptotes.

(a)

- The student must realize that the vertical line should not be there, and use "Zdecimal" to omit it.



(b)

- To find the vertical asymptote the student can use the trace function on the graph or use the table of values (where "ERROR" appears in the y -value, then the corresponding value of x is where the vertical asymptote is).

X	Y1
-5	1.6667
-4	2
-3	3
-2	ERROR
-1	-1
0	0
1	.33333

X = -2

Student's answer:

The vertical asymptote is at $x = -2$.

- To find the horizontal asymptote, the student will have to trace the curve for large or small x -values.

Student's answer:

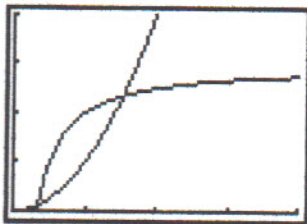
The horizontal asymptote will be when $y = 1$.

Teachers can, of course, teach the students how to calculate the asymptotes.

Paper 2, question 1

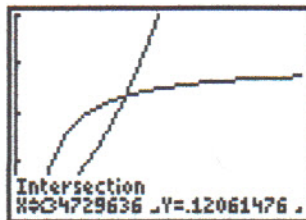
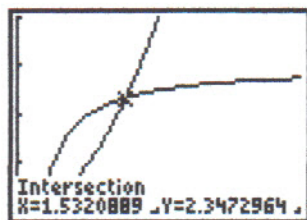
- (a) On the same graph sketch the curves $y = x^2$ and $y = 3 - \frac{1}{x}$ for values of x from 0 to 4 and values of y from 0 to 4. Show your scales on your axes.
- (b) Find the points of intersection of these two curves.
- (c) (i) Find the gradient of the curve $y = 3 - \frac{1}{x}$ in terms of x .
 (ii) Find the value of this gradient at the point $(1, 2)$.
- (d) Find the equation of the tangent to the curve $y = 3 - \frac{1}{x}$ at the point $(1, 2)$.

(a)



- The student should add the scales.

(b)



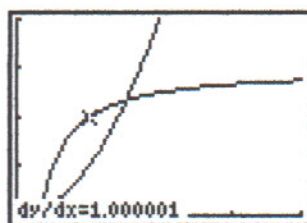
(c)

Student's answer:

(i) $dy/dx = 1/x^2$.

(ii) $dy/dx = 1/1 = 1$.

This value can also be found on the GDC.



(d)

Student's answer:

$$y = mx + c$$

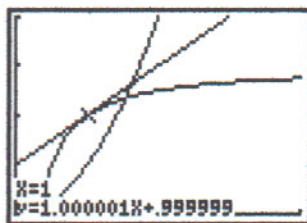
$$y = 1x + c$$

$$2 = 1 \times 1 + c$$

$$c = 1$$

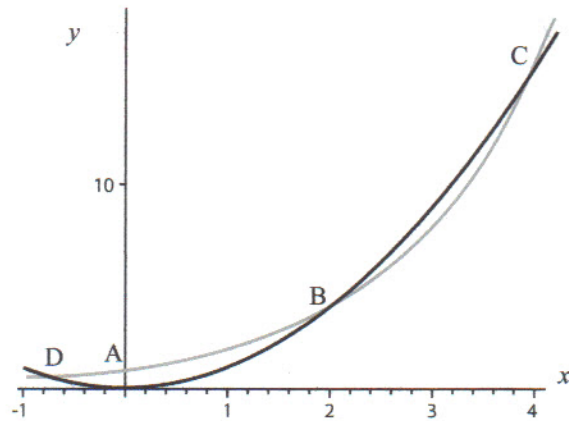
$$y = x + 1.$$

- The student should check on the GDC.



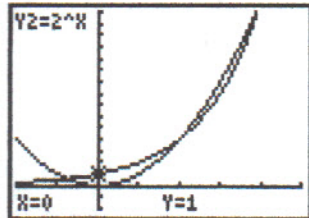
Paper 2, question 3

The figure below shows the graphs of the functions $y = x^2$ and $y = 2^x$ for values of x between -2 and 5 . The points of intersection of the two curves are marked as B, C and D.



- Write down the coordinates of the point A.
- Write down the coordinates of the points B and C.
- Find the x -coordinate of the point D.
- Write down, using interval notation, all values of x for which $2x \leq x^2$.

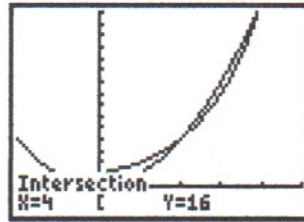
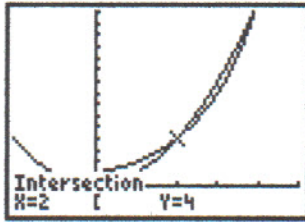
(a)



Student's answer:

When $x = 0$, $y = 1$ and so the coordinates of A are $(0, 1)$.

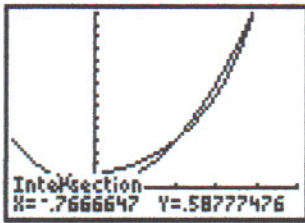
(b)



Student's answer:

The coordinates of B are (2, 4) and of C are (4, 16).

(c)



Student's answer:

The x-coordinate of D is -0.767 .

(d)

From the graph and the intersection points, students should be able to see that $2x \leq x^2$ for $2 \leq x \leq 4$ and $-\infty \leq x \leq -0.767$.

Paper 2, question 4

At the circus a clown is swinging from an elastic rope. A student decides to investigate the motion of the clown. The results can be shown on the graph of the function $f(x) = (0.8^x)(5 \sin 100x)$, where x is the horizontal distance in metres.

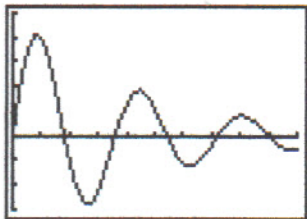
- Sketch the graph of $f(x)$ for $0 \leq x \leq 10$ and $-3 \leq f(x) \leq 5$.
- Find the coordinates of the first local maximum point.
- Find the coordinates of one point where the curve cuts the x -axis.

Another clown is fired from a cannon. The clown passes through the points given in the table below:

Horizontal distance (x)	Vertical distance (y)
0.00341	0.0102
0.0238	0.0714
0.563	1.69
1.92	5.76
3.40	10.2

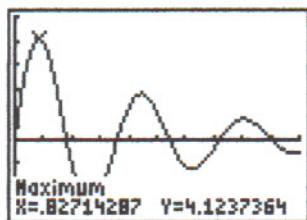
- Find the correlation coefficient, r , and comment on the value for r .
- Write down the equation of the regression line of y on x .
- Sketch this line on the graph of $f(x)$ in part (a).
- Find the coordinates of one of the points where this line cuts the curve.

(a)



- The student should add scales to the sketch.

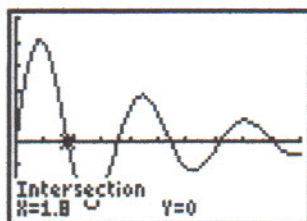
(b)



Student's answer:

The first maximum point is at (0.827, 4.12).

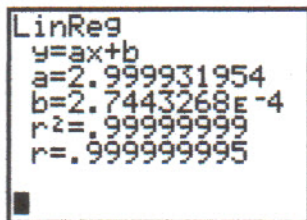
(c)



Student's answer:

(1.8, 0).

(d)



Student's answer:

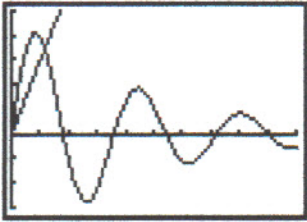
$r = 1$, therefore the correlation is perfect and positive.

(e)

Student's answer:

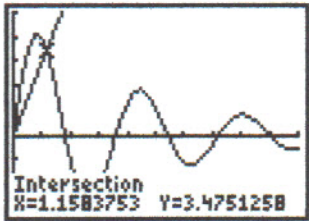
The equation of the regression line is $y = 3x + 0.000274$ or $y = 3x$.

(f)



- The student should add scales to the sketch.

(g)



Student's answer:

One point of intersection is (1.16, 3.48).