

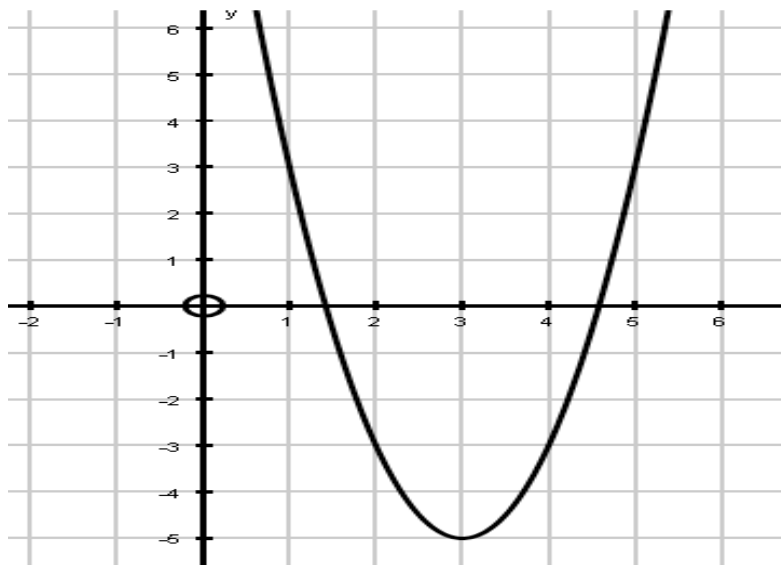
Non-calculator questions

1. The function $f(x)$ is defined as $f(x) = 2x^2 - 5x - 8$.
 - i) Write $f(x)$ in the form $f(x) = a(x + p)^2 + q$.
 - ii) Write down the vertex of the function $f(x)$.

2. The $g(x)$ is a relationship defined as $g(x) = \frac{1}{2x-1} + 4$.
 - i) Sketch the graph of $g(x)$.
 - ii) Write down a suitable domain for $g(x)$ so that it may become a function.
 - iii) Without calculating the inverse, find a suitable domain of the inverse of $g(x)$.

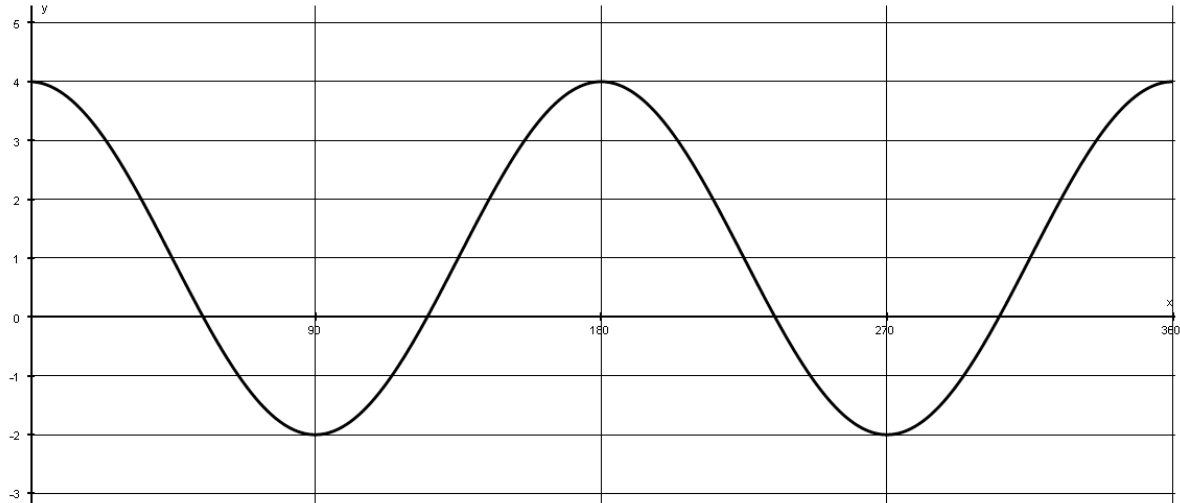
3. A quadratic equation is defined as $3x^2 + kx - 14 = 0$. Find the values of k , such that the equation has no solutions. Leave your answers as a surd in its lowest form.

4. The graph below shows the function $f(x) = a(x - p)^2 - q$.



Find the values of a , p , and q .

5. The graph below shows $y = a + b\cos(cx)$.



Find the values of a , b , and c .

6. A function is defined as $g(x)$. Describe in full each of the following transformations,

i) $g(x) + a$ ii) $g(-x)$ iii) $g(x + a)$

iv) $g^{-1}(x)$ v) $-g(x)$

7. Given that $y = \log_2 x$. Write down in terms of y ,

i) $\log_2 x^5$

ii) $\log_2\left(\frac{1}{x}\right)$

iii) $\log_{16} x$

Calculator questions

1. i) The first two terms of a geometric series are 75 and 60 respectively. Find,
- the common ratio of the series,
 - the sum to infinity,
 - the smallest number of terms of the series whose sum exceeds 90% of the sum to infinity.
- ii) The sum, S_n , of the first n terms of an arithmetic series is given by $S_n = 2n^2 + 8n$. Find,
- the value of the 12th term,
 - the smallest term of n for which the n^{th} term exceeds 600.
2. Calculate the following,
- i) $\sum_{n=50}^{100} 3n - 1$ ii) $\sum_{r=1}^{20} r^{1.2}$
3. Find the coefficient of the x^8 term in the expansion of $(3 - 2x^2)^7$.
4. Two functions are defined as $f(x) = e^{-2x}$ and $g(x) = \frac{1}{1-x}$.
Find,
- i) $f^{-1}(x)$ ii) $f \circ g(4)$
5. An arithmetic sequence is defined as $s = 7 + 11 + 15 + \dots + 151 + 155$.
Find the value of s .

6. A population model has been designed for a small industrial town in India. The first year of the model is at the start of 2003 when $t=0$, and the population is 15000.

The population model is written below,

$$P_N = P_0 e^{kt}$$

(t is the time in years and k is a constant).

- i) Write down the value of P_0 .
- ii) Given that the population at the start of 2008 is 18321 find the value of k .
- iii) Find the value of the population at the start of 2011.
- iv) In which year will the population double.

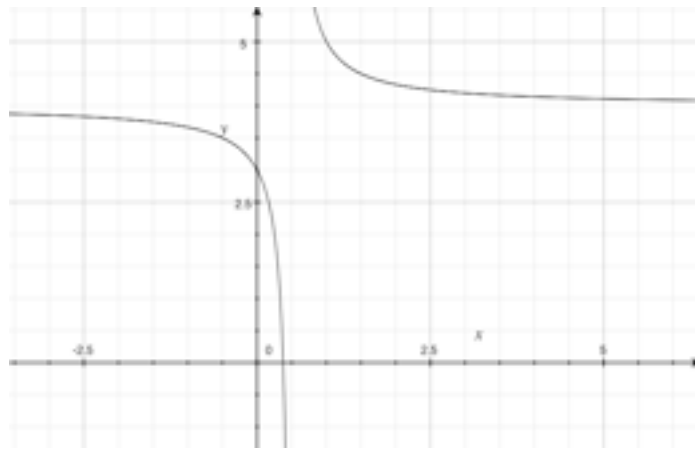
Answers

Non-calculator questions

1 i) $2\left(x-\frac{5}{4}\right)^2-\frac{89}{16}$

ii) $\left(\frac{5}{4}, -\frac{89}{8}\right)$

2. i)

ii) x can be any real number except x can not equal $\frac{1}{2}$

3. $k < 2\sqrt{42}$ and $k > -2\sqrt{42}$

4. $a=2, p=3, q=5$

5. $a=1, b=3, c=2$

6. i) translation vertically by a units.
 ii) reflection in the y -axis.
 iii) Translation horizontally by $-a$ units.
 iv) Reflection in the line $y=x$.
 v) Reflection in the x -axis.

Algebra and functions revision

IB SL

7. i) $5y$
ii) $-y$
iii) $\frac{y}{4}$

Calculator questions

1. i) a) $r=0.8$ ii) 375 iii) $n=11$
ii) a) 54 ii) $n=16$
2. i) 11424 ii) 18669
3. -15120
4. i) $f^{-1}(x)=-\frac{\ln x}{2}$ ii) 1.95
5. 3078
6. i) 15000
ii) $k=0.04$
iii) 20657
iv) 2020