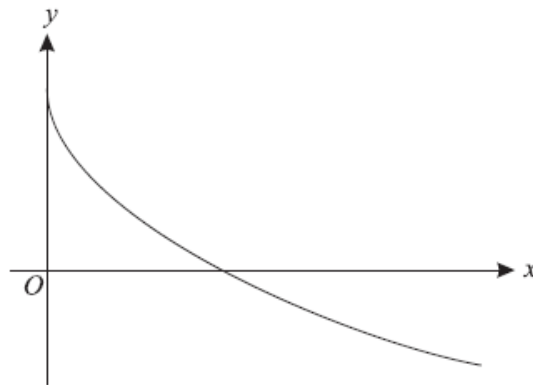


## Topic Y8 Functions and series (Post-TT A) [39]

1.



The function  $f$  is defined by  $f(x) = 2 - \sqrt{x}$  for  $x \geq 0$ . The graph of  $y = f(x)$  is shown above.

- (i) State the range of  $f$ . [1]
- (ii) Find the value of  $ff(4)$ . [2]
- (iii) Given that the equation  $|f(x)| = k$  has two distinct roots, determine the possible values of the constant  $k$ . [2]

(Total 5 marks)

2.

The 20th term of an arithmetic progression is 10 and the 50th term is 70.

- (i) Find the first term and the common difference. [4]
- (ii) Show that the sum of the first 29 terms is zero. [2]

(Total 6 marks)

3.

- (i) Give full details of a sequence of two transformations needed to transform the graph of  $y = |x|$  to the graph of  $y = |2(x + 3)|$ . [3]
- (ii) Solve the inequality  $|x| > |2(x + 3)|$ , showing all your working. [5]

(Total 8 marks)

4.

The amounts of oil pumped from an oil well in each of the years 2001 to 2004 formed a geometric progression with common ratio 0.9. The amount pumped in 2001 was 100 000 barrels.

- (i) Calculate the amount pumped in 2004. [2]

It is assumed that the amounts of oil pumped in future years will continue to follow the same geometric progression. Production from the well will stop at the end of the first year in which the amount pumped is less than 5000 barrels.

- (ii) Calculate in which year the amount pumped will fall below 5000 barrels. [4]
- (iii) Calculate the total amount of oil pumped from the well from the year 2001 up to and including the final year of production. [3]

(Total 9 marks)

5.

(i) The first three terms of an arithmetic progression are  $2x$ ,  $x + 4$  and  $2x - 7$  respectively. Find the value of  $x$ . [3]

(ii) The first three terms of another sequence are also  $2x$ ,  $x + 4$  and  $2x - 7$  respectively.

(a) Verify that when  $x = 8$  the terms form a geometric progression and find the sum to infinity in this case. [4]

(b) Find the other possible value of  $x$  that also gives a geometric progression. [4]

(Total 11 marks)