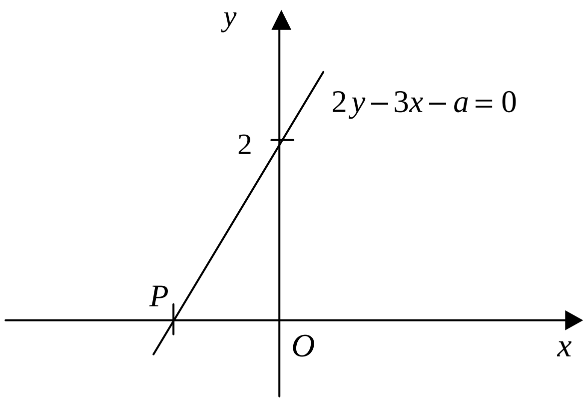
Section A

1)
In the figure, the line $2y - 3x - a = 0$ meets the x-axis at P and its y-intercept is 2. Find the coordinates of P.



A (-2,0)
B (-4/3,0)
C (-1,0)
D (-3/4,0)

2)
Find the values of x which satisfy either

$$-x > 2 \ or \ \frac{3x+5}{-2} < x$$

A, x<-3
B, x<-2
C, x<-1
D ,x>1

3)
If the sum to infinity of the geometric sequence $1, x, x^2, x^3, \ldots$ is $\frac{5}{2}$,find x
A. -3
B. 3
C. –3/5
D. 3/5

Section A Solutions

1)

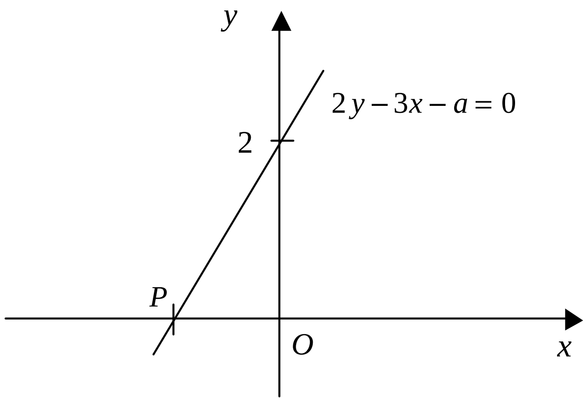
$$\text{The line} \quad 2y - 3x - a = 0$$

$$y = \frac{3x}{2} + \frac{a}{2}$$

$$\text{If } y\text{-intercept is } 2, \quad \therefore \frac{a}{2} = 2$$

$$a = 4, \quad y = \frac{3x}{2} + \frac{4}{2} = y = \frac{3x}{2} + 2$$

$$\text{when } y = 0, \quad x = -\frac{4}{3}$$



2)

$$-x > 2 \text{ or } \frac{3x+5}{-2} < x$$

$$x < -2$$

$$\frac{3x+5}{-2} < x$$

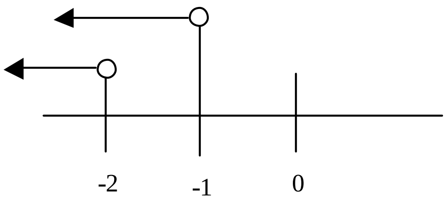
$$3x + 5 > -2x,$$

$$5x > -5$$

$$x < -1$$

$$x < -2 \text{ or } x < -1$$

$$\therefore \quad x < -1$$



3)

$$\text{The sequence } 1, x, x2, x3, ..$$

$$R = x \quad a = 1$$

$$S(\infty) = \frac{a}{1-R}$$

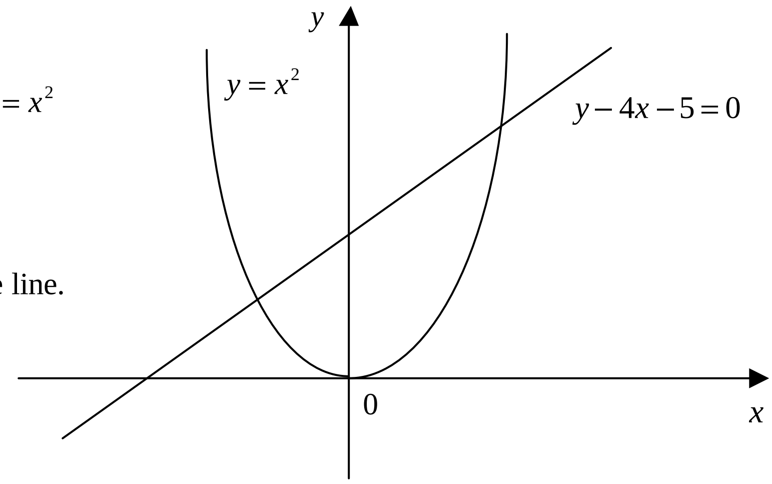
$$\frac{1}{1-x} = \frac{5}{2}$$

$$5 - 5x = 2$$

$$x = \frac{3}{5}$$

Section B

4)
The figure shows the graphs of $y = x^2$ and $y - 4x - 5 = 0$



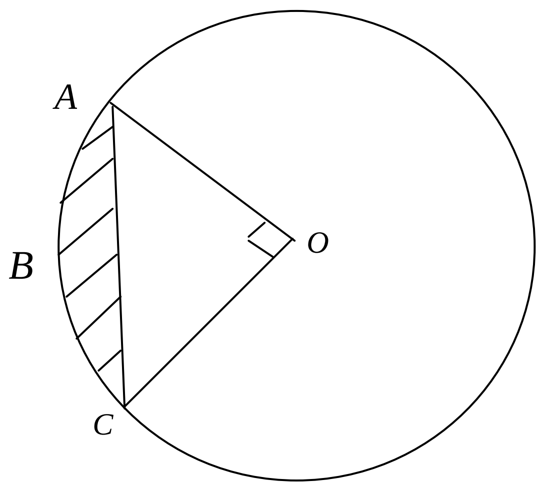
(a)
Find the coordinates of the points of intersection of the curve and the line.
(3 marks)

(b)
Hence solve the inequality
$x^2 - 4x - 5 < 0$
(2 marks)

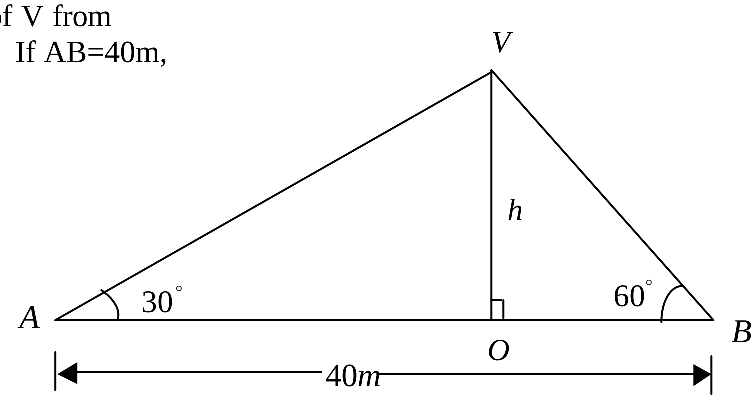
5)

In the figure, ABC is a circle with center O and radius 10.
$\angle AOC = p/2$ .Calculate, correct to 2 decimal places,

(a) the area of sector $OABC$ (2 marks)
(b) the area of ΔOAC (2 marks)
(c) the area of segment ABC (1 marks)



6)
In the figure, the angles of elevation of V from A and B are 30° and 60° respectively. If AB=40m, Find h, correct to 2 decimal places.
(5 marks)



7)
Two cards are selected at random from ten cards numbered 1 to 10. Find the probability that the sum is even if

a) the two cards are drawn one after the other with replacement, (3 marks)
b) the two cards are drawn together. (2 marks)

Section C

8)
For an arithmetic progression with first term a and common difference d. The third term and fifth term of the arithmetic progression are 19 and 13 respectively.

a) Find a and d. (5 marks)
b) Find the first negative term of the sequence (5 marks)
c) Let S_n be the sum of the first n terms. Find the largest value of S_n.
(5 marks)

Solutions:

Section B

4)

$a)$

$y = x^2 \cdots\cdots\cdots(1) \qquad [2M]$

$y - 4x - 5 = 0 \cdots\cdots\cdots(2)$

$Sub. (1)\ to\ (2),$

$x^2 - 4x - 5 = 0$

$(x-5)(x+1) = 0$

$\therefore x = 5\ or\ x = -1 \qquad [1A]$

$b)$

$x^2 - 4x - 5 < 0$

$(x-5)(x+1) < 0 \qquad [1M]$

$\therefore -1 < x < 5 \qquad [1A]$

5)

a)

The area of sector $OABC$ $= \frac{1}{2} r^2 q \qquad [1M]$

$= \frac{1}{2} \times 10^2 \times \frac{p}{2}$

$= 25p$

$= 78.54 \quad (Correct\ to\ 2\ decimal\ places) \qquad [1A]$

b)

The area of ΔOAC $= \frac{1}{2} r^2 \sin q \quad [1M]$

$= \frac{1}{2} \times 10^2 \sin \frac{p}{2}$

$= 50 \qquad [1A]$

c)

the area of segment ABC $= 78.54 - 50$

$= 28.54 \qquad [1A]$

6)

$Let\ OB = x,\qquad [1M]$

$Consider\quad \Delta VOB,$

$\tan 60° = \frac{h}{x}$

$x = \frac{h}{\tan 60°} \cdots\cdots (1) \qquad [1M]$

$Consider\ \Delta VOA,$

$\tan 30° = \frac{h}{40 - x}$

$\therefore 40 - x = \frac{h}{\tan 30°} \cdots\cdots\cdots (2) \qquad [1M]$

$Sub\ (1)\ to\ (2),$

$40 - \frac{h}{\tan 60°} = \frac{h}{\tan 30°} \qquad [1M]$

$40 = h\left(\frac{1}{\tan 30°} + \frac{1}{\tan 60°}\right)$

$h = 17.32m \qquad [1A]$

7)

$a)$

$P(sum\ is\ even\ without\ replacement)$

$= \frac{5}{10} \times \frac{4}{9} \qquad [2M]$

$= \frac{2}{9} \qquad [1A]$

$b)$

$P(sum\ is\ even\ with\ replacement)$

$= \frac{5}{10} \times \frac{5}{10} \qquad [1M]$

$= \frac{1}{4} \qquad [1A]$

8)

$a)$

$Let\ n\ be\ the\ n^{th}\ term$

$The\ general\ term\ is\ T(n) = a + (n-1)d \quad [1M]$

$T(3) = a + (3-1)d = 19$

$a + 2d = 19 \cdots\cdots\cdots (1) \quad [1M]$

$T(5) = a + (5-1)d = 13$

$a + 4d = 13 \cdots\cdots\cdots (2) \quad [1M]$

$(2) - (1),$

$2d = -6$

$d = -3 \quad [1A]$

$a = 19 + 6 = 25 \quad [1A]$

$b)$

$T(n) = 25 - (n-1)3 < 0 \quad [2M]$

$n - 1 > \frac{25}{3}$

$n > 9.333 \quad [1M]$

$\therefore n = 10 \quad [1M, 1A]$

$\therefore$the first negative term of the sequence is 10

c)

Since the first negative term of the sequence is 10, the last positive term is 9 [1M]

$S_n = \frac{n}{2}[2a + (n-1)d] \quad [1M]$

$n = 9 \quad [1M]$

$S_9 = \frac{9}{2} \times [2 \times 25 + (9-1) \cdot -3] \quad [1M]$

$= 117 \quad [1A]$