KAMBALA GIRLS' SCHOOL

MATHEMATICS

3 UNIT

PRELIMINARY ASSESSMENT TASK # 2

MAY , 2001

Time Allowed : *50 minutes*
Reading Time : *5 minutes*

INSTRUCTIONS :

- This task contains 5 questions of equal value. Marks for each question are shown.
- Answer all questions on the writing paper provided. Start each question on a new page.
- Approved calculators may be used.
- Show all necessary working.
- Marks will be deducted for careless or badly arranged work.

Question 1 : (Start a new page) Marks

(a) Find the domain of : 2

(i) $y = \dfrac{1}{(x-3)(2-x)}$ (ii) $y = \sqrt{2-x} - \sqrt{x-1}$

(b) Solve for x ; $\dfrac{2x+1}{x-4} \leq 1$ 3

(c) If $f(x) = 6 - 2x$; 5

(i) find $f(-3)$ (ii) solve $f(t) = 3t$ (iii) solve $f(2-t) \geq 2-t$

(d) Simplify $\dfrac{4^n - 1}{2^n - 1}$ 2

Question 2 : (Start a new page) Marks

(a) A function $g(x)$ is defined by : 4

$$g(x) = \begin{cases} 1-x & , \quad for \quad x < 0 \\ x^2 + 1 & , \quad for \quad x \geq 0 \end{cases}$$

(i) Find the value of $g(-2) + g(0) + g(3)$.

(ii) Sketch the graph of $y = g(x)$.

(b) State the domain and range of $y = 3^x + 1$. 2

(c) If $2x + y + 3 + \sqrt{4x - 3y} = 5 + 2\sqrt{6}$, find the values of x and y . 3

(d) On a single number plane diagram, shade the region for which : 3

$y \leq x^2$, $y \geq 0$, $y < \sqrt{9 - x^2}$

are simultaneously true.

Question 3 : (Start a new page) Marks

(a) On separate number plane diagrams, draw neat, fully labelled sketches of : 8

(i) $y = |2x - 1|$ (iii) $y = x^2 - 4x$

(ii) $y = \dfrac{-2}{x}$ (iv) $x^2 + y^2 = 4$

(b) Solve the following equations for x : 4

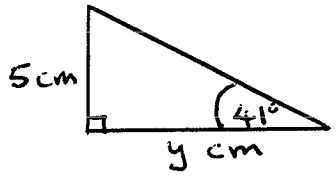
(i) $x^3 - 7x^2 + 12x = 0$ (ii) $3^{2x+1} - 26(3^x) - 9 = 0$

Question 4 : (Start a new page) Marks

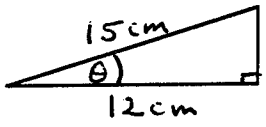
(a) Determine whether the following functions are odd, even or neither. Justify your answer. 6

(i) $f(x) = 1 - 2x^2$ (ii) $g(x) = x - x^3$ (iii) $h(x) = f(g(x))$

(b) Find, correct to one decimal place, the value of y . 2



(c) Find, correct to the nearest minute, the size of the angle θ . 2



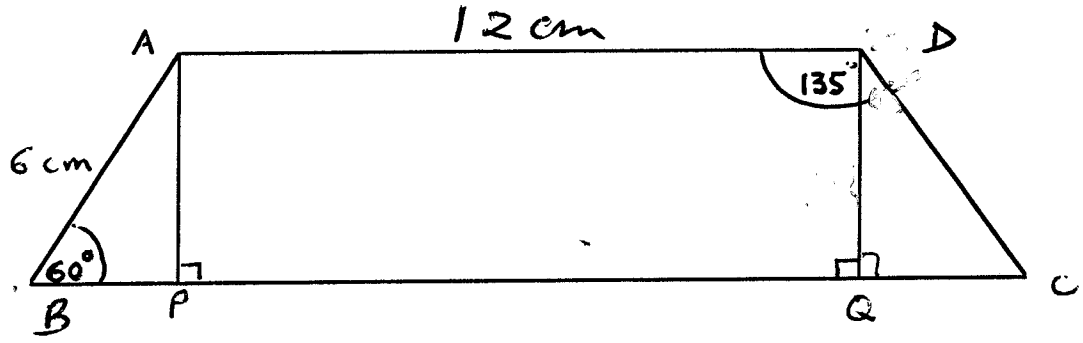
(d) If θ is acute, and $\sin\theta = \dfrac{12}{13}$, find the exact values of : 2

(i) $\cos\theta$ (ii) $\cot\theta$

Question 5 : (Start a new page) Marks

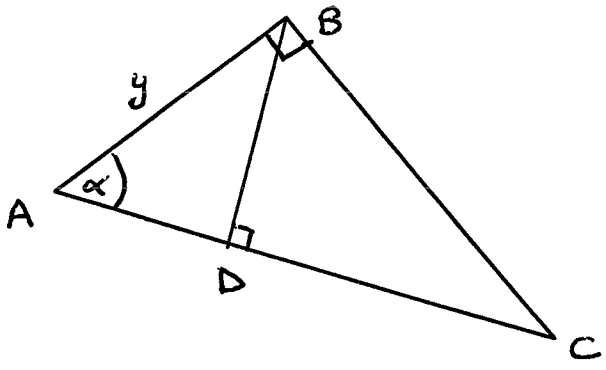
(a) The diagram below shows a trapezium ABCD in which AD is parallel to BC, AB = 6 cm, AD = 12 cm, and $\angle ADC = 135°$. Perpendiculars are drawn to BC at P and Q. 4

(i) Show that BP = 3 cm.
(ii) Show that AP = $3\sqrt{3}$ cm.
(iii) Find the exact length of BC.



(b) The diagram below shows a right - angled triangle ABC, right - angled at B. The line BD is drawn perpendicular to AC. AB = y cm, and $\angle BAC = \alpha°$. Find, in terms of y and α, the lengths of : 8

(i) AD (ii) BD (iii) BC (iv) AC



END OF TASK

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QUESTION 1.

a)

(i) D: $x \neq 2$ $x \neq 3$

(ii) D: $2-x \geqslant 0$ $x-1 \geqslant 0$

$x \leqslant 2$ $x \geqslant 1$

$\therefore$ D: $1 \leqslant x \leqslant 2$

b) $0 \leqslant 1 - \dfrac{2x+1}{x-4}$

$0 \leqslant \dfrac{x-4-(2x+1)}{x-4}$

$0 \leqslant \dfrac{-x-5}{x-4}$

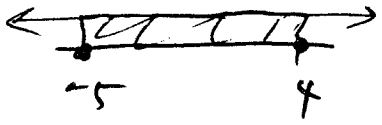
$\therefore$ $-x-5 \geqslant 0$ $x-4 > 0$

$-x \geqslant 5$ $x > 4$

$\therefore x \leqslant -5$

CASE 1: $x \leqslant -5 \cap x \geqslant 4$

CASE 2: $x \geqslant -5 \cap x < 4$



$\therefore$ $\boxed{-5 \leqslant x < 4}$

c) $f(x) = 6-2x$

(i) $f(-3) = 6-2(-3)$

$= 6+6$

$= \underline{\underline{12}}$

(ii) $f(t) = 3t$

$6-2t = 3t$

$5t = 6$

$\therefore \boxed{t = \dfrac{6}{5}}$

(iii) $f(2-t) \geqslant 2-t$

$6-2(2-t) \geqslant 2-t$

$6-4+2t \geqslant 2-t$

$-2+2t \geqslant 2-t$

$3t \geqslant 0$

$\therefore \boxed{t \geqslant 0}$

d) $\frac{4^n - 1}{2^n - 1}$

$= \frac{(2^n)^2 - 1}{2^n - 1}$

$= \frac{(2^n - 1)'(2^n + 1)}{2^n - 1'}$

$= 2^n + 1$

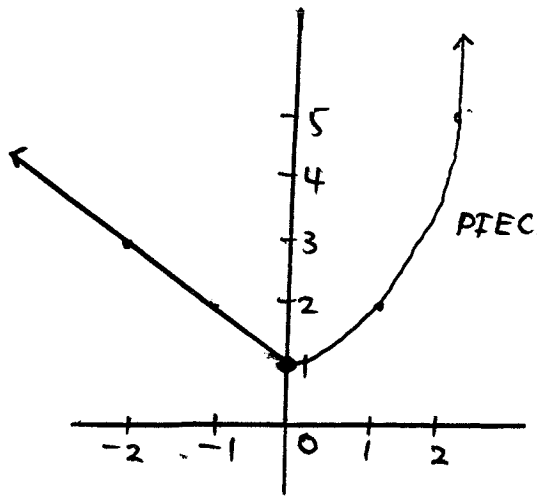
QUESTION 2:

a) (i) $g(-2) + g(0) + g(3)$

$= 3 + 1 + 10$

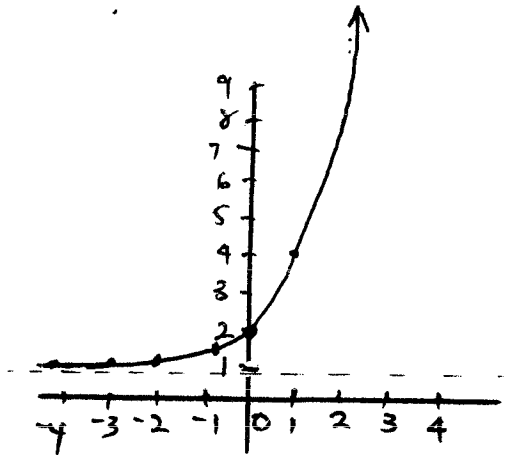
$= 14$

(ii)



PIECE MEAL.

b) $y = 3^x + 1$



D: All real x

R: $y > 1$

c) $2x + y + 3 + \sqrt{4x - 3y} = 5 + 2\sqrt{6}$

$= 5 + \sqrt{24}$

$\therefore 2x + y + 3 = 5 \quad -(1)$

$4x - 3y = 24 \quad -(2)$

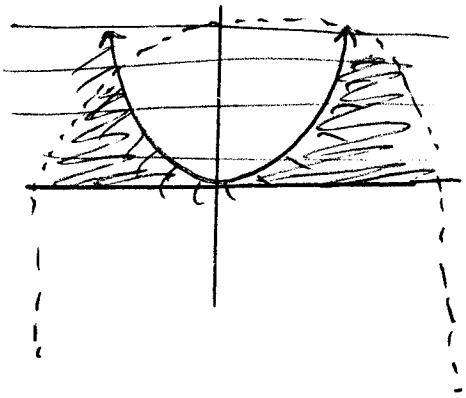
$6x + 3y = 6 \quad -(3)$

$\therefore 10x = 30$

$\therefore x = 3$

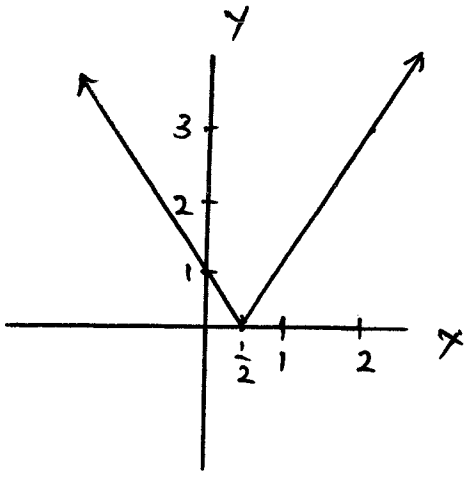
$y = -4$

d) $y \leq x^2, y \geq 0, y < \sqrt{9 - x^2}$

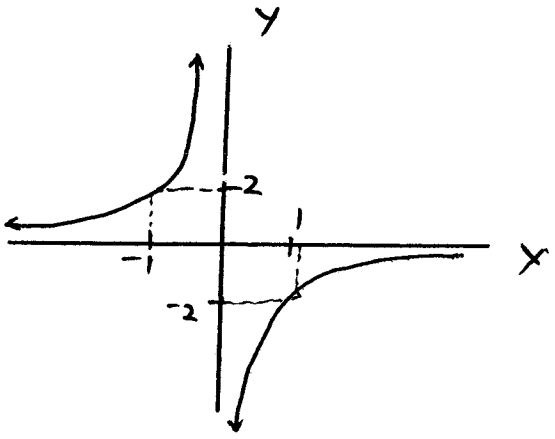


QUESTION 3:

a) (i) $y = |2x-1|$



(ii) $y = \frac{-2}{x}$

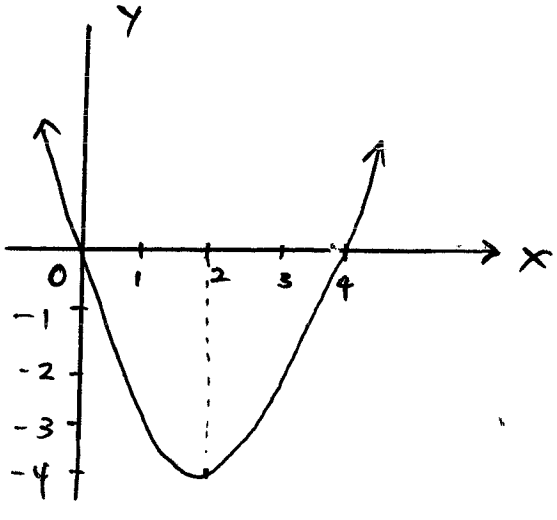


(iii) $y = x^2 - 4x$

$x^2 - 4x = 0$

$x(x-4) = 0$

$x = 0$ and 4



b)(i) $x^3 - 7x^2 + 12x = 0$

$x(x^2 - 7x + 12) = 0$

$x(x-4)(x-3) = 0$

$\therefore x = 0$ or 4 or 3

(ii) $3^{2x+1} - 26(3^x) - 9 = 0$

let $u = 3^x$

$\therefore 3^{2x} \cdot 3^1$

$= 3 \cdot (3^x)^2 \Rightarrow 3u^2$

$\therefore 3u^2 - 26u - 9 = 0$

$(3u+1)(u-9) = 0$

$u = 9$ $\quad \therefore 3u = -1$

$3^x = 3^2$ $\quad 3(3^x) = -1$

$\therefore x = 2$ $\quad 3^x \neq -\frac{1}{3}$

NO SOL^N

QUESTION 4:

a) (i) $f(x) = 1-2x^2$

$f(-x) = 1-2(-x)^2$

$= 1-2x^2$

$= f(x)$

$\therefore$ EVEN

(ii) $g(x) = x-x^3$

$g(-x) = -x-(-x)^3$

$= -x+x^3$

$= -(x-x^3)$

$= -g(x)$

$\therefore$ ODD

(iii) $h(x) = f(g(x))$

$h(-x) = f(g(-x))$

$= f(-g(x))$

$= f(g(x))$

$= h(x)$

$\therefore$ EVEN.

b) $\tan 41^\circ = \frac{5}{Y}$

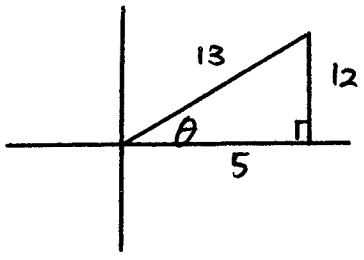
$Y = \frac{5}{\tan 41^\circ}$

$= 5.8$ cm (1DP).

c) $\cos\theta = \frac{12}{15}$

$\therefore \theta = 36^\circ 52'$

d) (i)

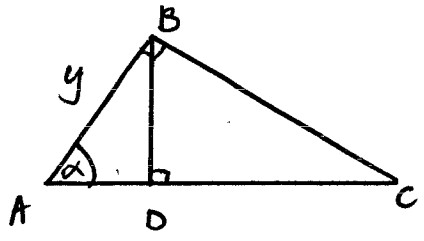


$\cos\theta = \frac{5}{13}$

$\cot\theta = \frac{5}{12}$

QUESTION 5: (a)(iii) $15+3\sqrt{3} = 3(5+\sqrt{3})$ cm.

b)



(i) $\cos\alpha = \frac{AD}{y}$

$\therefore AD = y\cos\alpha$

(ii) $\sin\alpha = \frac{BD}{y}$

$\therefore BD = y\sin\alpha$

(iii) $\tan\alpha = \frac{BC}{y}$

$\therefore BC = y\tan\alpha$

(iv) $\cos\alpha = \frac{y}{AC}$

$AC = \frac{y}{\cos\alpha}$

$\therefore AC = y\sec\alpha$