

QUESTION 1. a) Given that  $f(x) = x^2 - x$ , find

(i)  $f(-3)$

(ii)  $x$  when  $f(x) = 6$

(b) If  $f(x) = ax^2 + bx + c$  find the value of  $f(x) - f(-x)$ .

Question 2.

(a) State:

(i) the natural (largest possible) domain; and

(ii) the range

of the function  $f$  for which  $f(x) = \sqrt{1 - x^2}$ .

(b) Sketch the graph of the function in (a) (not on graph paper).

Question 3. Draw sketches (not accurately drawn graphs) of the following curves, showing essential features:

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

(b)  $x^2 + y^2 = 9$

(c)  $y = \frac{-4}{x}$

(d)  $y = |x| + 1$

(e)  $y = (x + 2)^3$

State the domain and range of each.

f)  $y = \sqrt{25 - x^2}$

Which, if any, are odd or even functions.

QUESTION 4. A function is defined by the following rule:

$$f(t) = 3t + 2 \quad \text{for } t \geq 0$$

$$= t^2 + 2 \quad \text{for } t < 0$$

(a) Draw a neat sketch of the function for  $-2 \leq t \leq 2$

(b) Evaluate  $f(-2) + f(0) + 3f(1)$

(c) Is the function  $f$  continuous at  $t = 0$ ?

Question 5. Sketch the curve  $y = \left| \frac{2}{x} \right|$

Is the function even, odd or neither?

Give a full explanation for your answer:

QUESTION 6. On a number plane diagram, shade the region for which the following inequalities are satisfied simultaneously

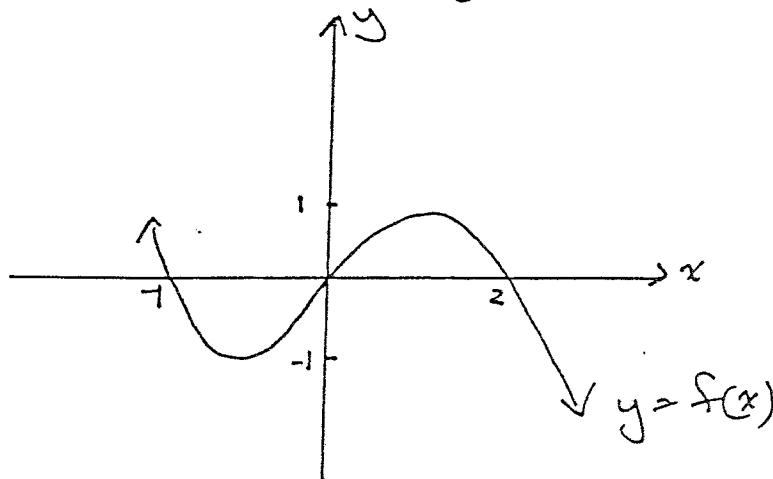
$$x + y > 2$$

$$y \leq 4$$

$$y \geq x^2$$

Question 7

Drawn below is the graph of  $y = f(x)$



Draw a neat sketch of:

a)  $y = -f(x)$

b)  $y = |f(x)|$

c)  $y = f(x) + 1$

d)  $y = f(x+1)$

QUESTION 1

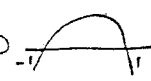
i)  $f(-3) = 9 - 3 = 12$

ii)  $x^2 - x = 6$   
 $x^2 - x - 6 = 0$   
 $(x-3)(x+2) = 0$   
 $x = 3$  or  $x = -2$

b)  $f(x) - f(-x)$   
 $= ax^2 + bx + c - [ax^2 - bx + c]$   
 $= 2bx$

QUESTION 2

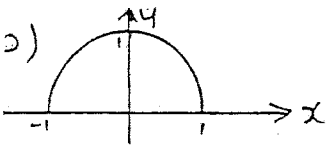
i)  $1 - x^2 \geq 0$   
 $(1-x)(1+x) \geq 0$



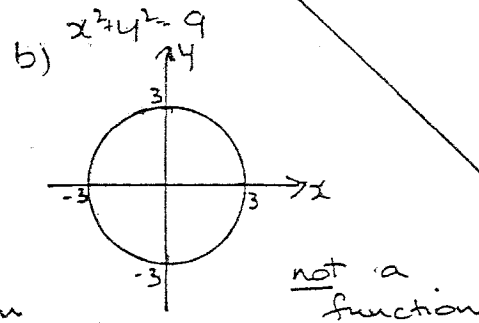
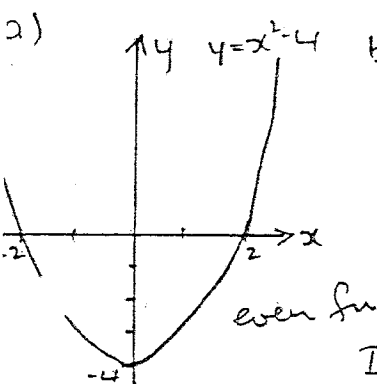
$-1 \leq x \leq 1$

for  $x \in \{-1 \leq x \leq 1, x \in \mathbb{R}\}$

ii) range =  $\{y : 0 \leq y \leq 1, y \in \mathbb{R}\}$



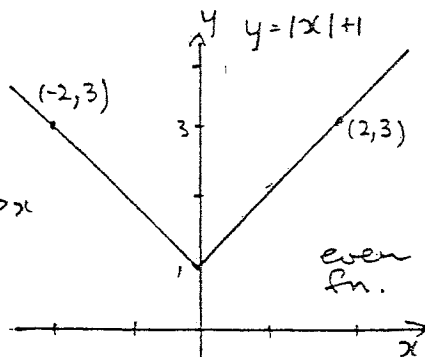
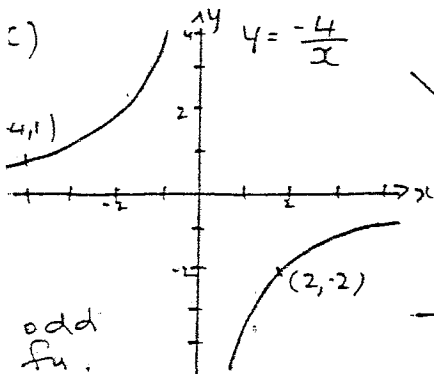
QUESTION 3



$D = \{x : -3 \leq x \leq 3, x \in \mathbb{R}\}$

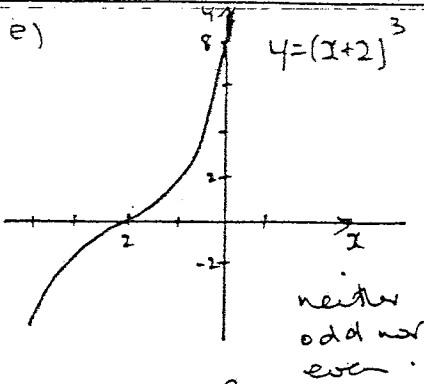
$R = \{y : -3 \leq y \leq 3, y \in \mathbb{R}\}$

$D = x \in \mathbb{R}$   
 $R = \{y : y \geq -4, y \in \mathbb{R}\}$



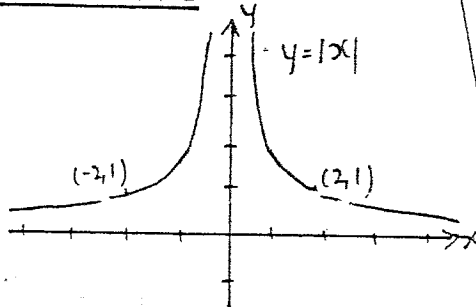
Dom =  $x \in \mathbb{R}, x \neq 0$   
 Range =  $y \in \mathbb{R}, y \neq 0$

Dom =  $x \in \mathbb{R}$   
 Range =  $\{y : y \geq 1, y \in \mathbb{R}\}$



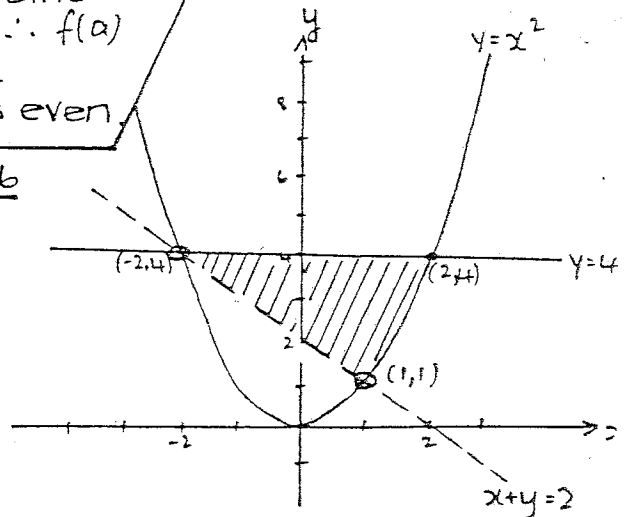
Domain =  $x \in \mathbb{R}$   
 Range =  $x \in \mathbb{R}$

QUESTION 5



The graph is symmetric about the y-axis,  $\therefore f(a) = f(-a)$  for all  $a$   
 $\therefore$  the function is even.

QUESTION 6



Test (0, 0) in  $x + y > 2$

Is  $0 + 0 > 2$ ? NO

Test (0, 1) in  $y \geq x^2$

Is  $1 \geq 0^2$ ? YES

QUESTION 7

