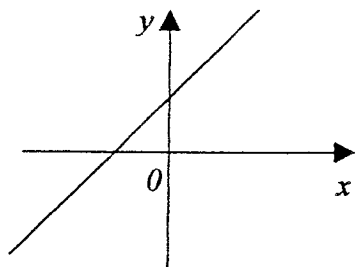## QUESTION 1

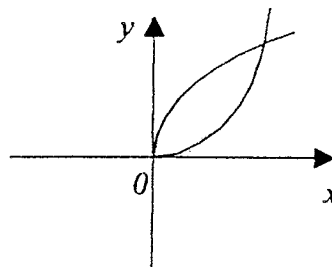a)   Which of these figures defines a function and which defines a relation which is not a function? (4 marks)
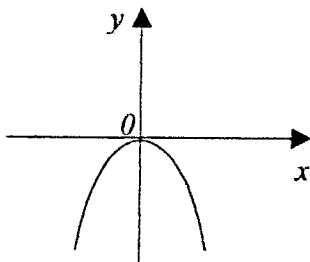
a.   b.
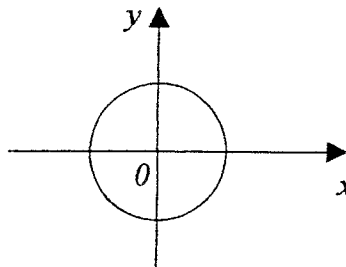

c.   d.

b)   For the function $f(x) = 2x - 1$, find the value of, $f(-1)$, $f(2)$ and $f(\frac{1}{4})$; (3 marks)

c)   For the function $f(x) = |x - 1|$ find the value of $f(2)$, $f(-2)$ and $f(0)$. (3 marks)

QUESTION 2

a)   The equation $y = 4x^2$ represents a relation between x and y in the XY-plane.

   i.   Find the value(s) of y when $x = -1$, 16. (2 marks)

   ii.   What is the largest possible domain for the variable x? (1 mark)

   iv.   Sketch the relation $y = 4x^2$. (3 marks)

b)   Find the domain and range of $y = \dfrac{1}{x+1}$. (2 marks)

c)   Find the domain and range of $y = \sqrt{4-x^2} - \sqrt{x^2-4}$ (4 Marks)

d)   The following figures each define a function. Describe the domain of each function. (4 marks)
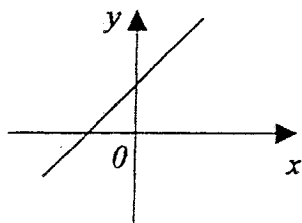
a.   b.
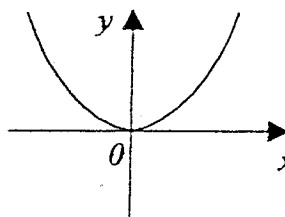
QUESTION 3

a) For the function $y = 2x - x^2$, complete the table below then sketch the function. (4 marks)

x	-2	-1	0	1	2	3	4
y							

b) For the function $y = \dfrac{1}{x-3}$:

   i. Complete the table below: (1 mark)

| x	-1	0	1	2	2·5	2·9	3	3·5	3.5	4	5	6
y												

   ii. Can this function ever attain the value *0*? Explain your answer. (2 marks)
   iii. Does this function have a value when $x = 3$? (1 mark)
   iv. Describe the behaviour of the function as x approaches *3* from *2*. (1 mark)
   v. Sketch the function $y = \dfrac{1}{x-3}$. (3 marks)

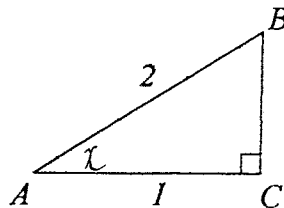c) State whether the function $f(x) = x^4 + x^2 - 1$ is even, odd or neither. Prove. (3 marks)
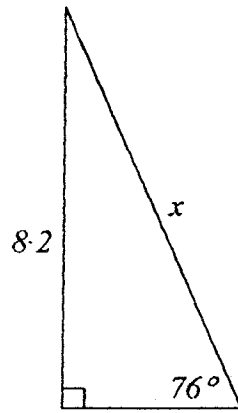
QUESTION 4

a) In the triangle shown, find:
   a. *sin θ;*
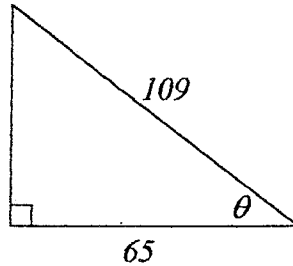   b. b. *cos θ;*
   c. c. *tan θ* (3 marks)
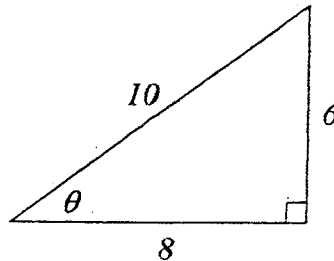
b) i. Calculate the exact length of *BC*. (1 mark)
    ii. Find the value of *cot* $\angle BAC$. (1 mark)

c)   Find x (to 1 decimal place). (2 marks)

8·2

x

76°

d)   Find θ (to the nearest minute). (2 marks)

109

θ

65

QUESTION 5

a)   A ladder *15* m long is inclined to a wall at an angle of *45°*. How far up the wall does the ladder reach? Answer correct to 1 decimal place. (2 marks)

b)   A man on the same level as the base of *75* m high tower, observes the angle of elevation of the top of the tower to be *25°*. After walking x metres towards the base of the tower, he then observes the angle of the elevation to be *38°*. Find (to the nearest metre) the distance x metres between his first and second observation points. (3 marks)

75 m

25°   38°

x m
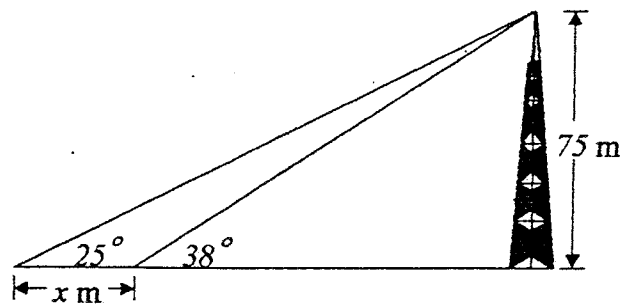
c)   From a plane flying at a constant altitude of *10 000* m, the angle of depression of two boats is observed. The angle of depression of boat *A* is *15°10'* and at the same instant the angle of depression of boat *B* is *12°33'*. Find (to the nearest metre) the distance x between the two boats. (4 marks)
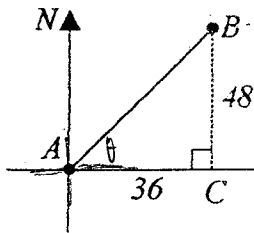
15°10'   12°33'

10 000 m

15°10'   12°33'

A x m   B
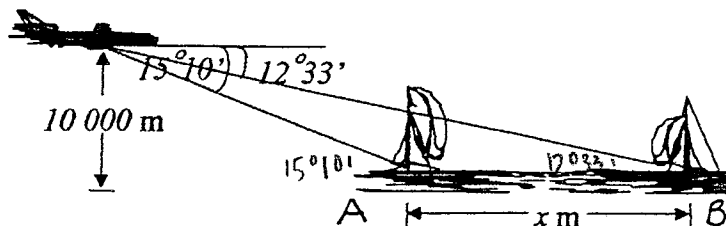
QUESTION 6

a)   Write down the bearing of B from A. (1 mark)

N

B •15°

A
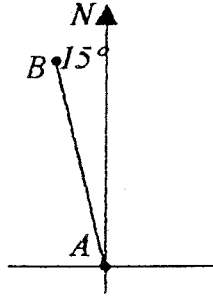
b)   Find the bearing of B from A (to the nearest degree). (2 marks)

N   •B

A   θ   48

            36   C

c)   A plane takes off and flies *250* km on a course bearing *345°*. It then turns and flies *375* km on a course bearing *300°*. Find how far the plane is then west of its starting position. Draw a diagram and give your answer to the nearest kilometre. (5 marks)

[[End Of Qns]]

QUESTION 1 (10 marks)

a) Function
b) Relation
c) Function
d) Relation.

b) $f(x) = 2x - 1$
$f(-1) = -3$

$f(2) = 3$

$f\left(\frac{1}{4}\right) = -\frac{1}{2}$

) $f(x) = |x - 1|$

$f(2) = 1$

$f(-2) = 3$

$f(0) = 1$

QUESTION 2 (16 marks)

i) $y = 4x^2$
when $x = -1$ $y = 4$

when $x = 16$ $y = 1024$

ii) Domain is all real values

iii)
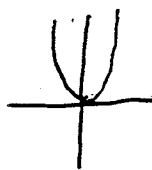
') $y = \frac{1}{x+1}$

Domain $x \neq -1$
Range $y \neq 0$

c) $y = \sqrt{4 - x^2} - \sqrt{x^2 - 4}$

Domain $x = \pm 2$
Range $y = 0$

a) Domain: all real values
b Domain: all real values.

QUESTION 3,

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

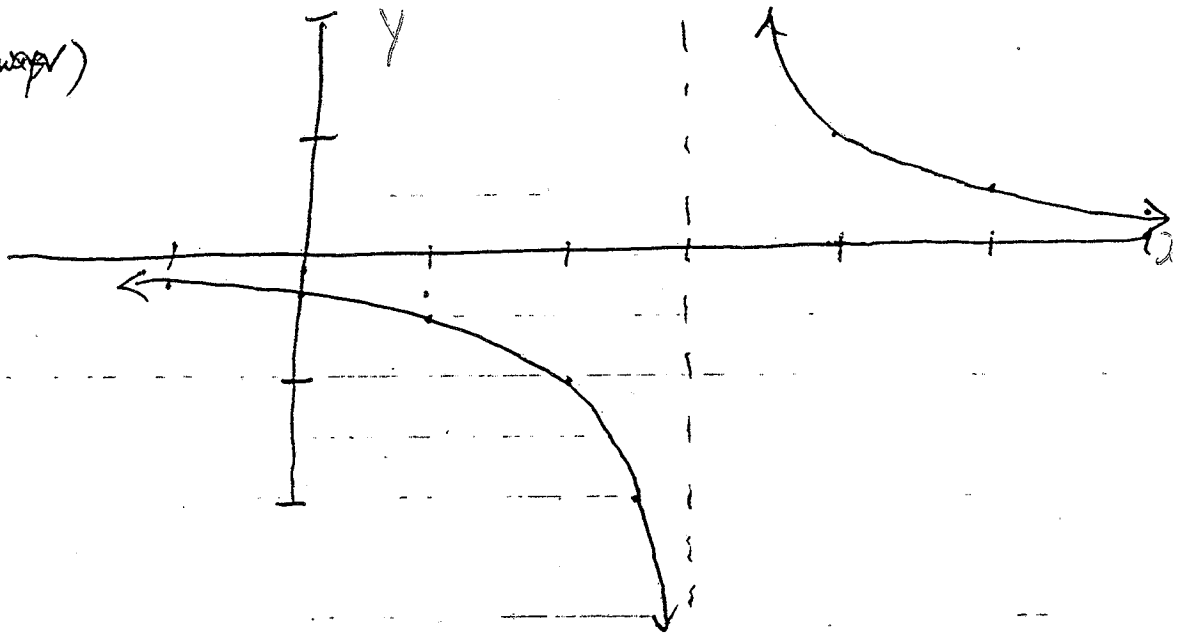| x	-2	-1	0	1	2	3	4
y	-8	-3	0	1	0	-3	-8

(1,1)
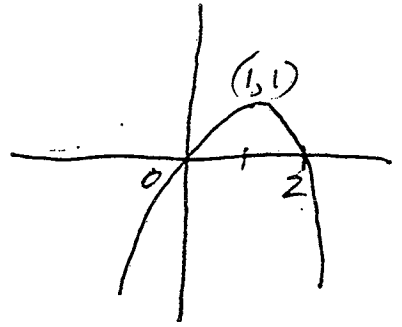
b) i) $y = \dfrac{1}{x-3}$

x	-1	0	1	2	2.5	2.9	3	3.5	4	5	6
y	$-\frac{1}{4}$	$-\frac{1}{3}$	$-\frac{1}{2}$	-1	-2	-10	—	2	1	$\frac{1}{2}$	$\frac{1}{3}$

i) No numerator always)
ii) No.
v) $y \to -\infty$

c) $f(x) = x^4 + x^2 - 1$
$f(-x) = (-x)^4 + (-x)^2 - 1$
$f(-x) = x^4 + x^2 - 1$

$\underline{f(x) = f(-x)}$ Even Function.

QUESTION 4 (9 marks)

a) $\sin\theta = \dfrac{6}{10}$ ① $\cos\theta = \dfrac{8}{10}$ ① $\tan\theta = \dfrac{6}{8}$ ①

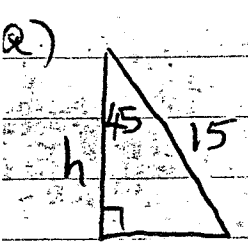b) i) Using Pythagoras' $BC = \sqrt{3}$ ①   ii) $\cot\angle BAC = \dfrac{1}{\sqrt{3}}$ ①

c) $\sin 76 = \dfrac{8.2}{x}$

$x = \dfrac{8.2}{\sin 76}$

$x = 8.5$ ②

d) $\cos\theta = \dfrac{65}{109}$

$\theta = 53°24'$ ②

$1\tfrac{1}{2}$ if not minutes

QUESTION 5 (9 marks)

a)

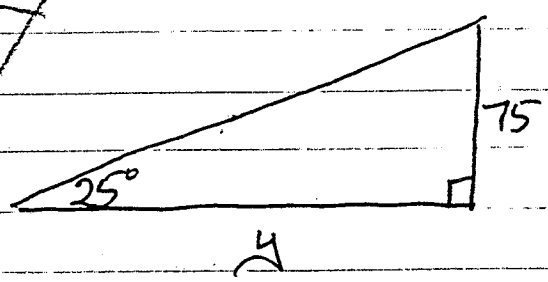$\cos 45 = \dfrac{h}{15}$

$10.6_m = h$ ②

1 if Sin used

b)
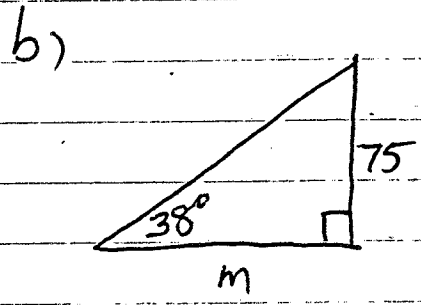
$\tan 38 = \dfrac{75}{m}$

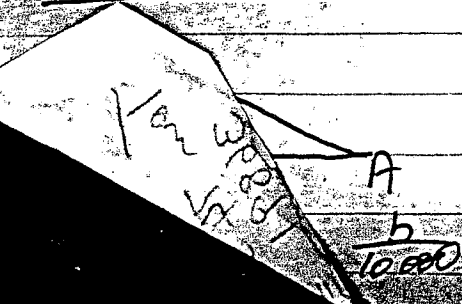$m = \dfrac{75}{\tan 38}$

$m = 96.0_m$
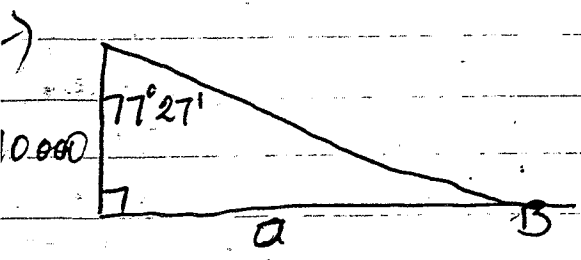
$\tan 77°27' = \dfrac{a}{10\,000}$

$44922_m = a$ 2

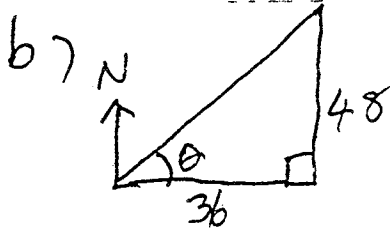$\tan 25 = \dfrac{75}{y}$

$y = \dfrac{75}{\tan 25}$

$y = 160.8_m$

$x = y - m$

$x = 160.8 - 96$
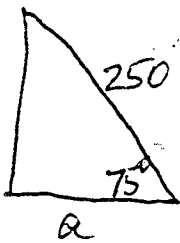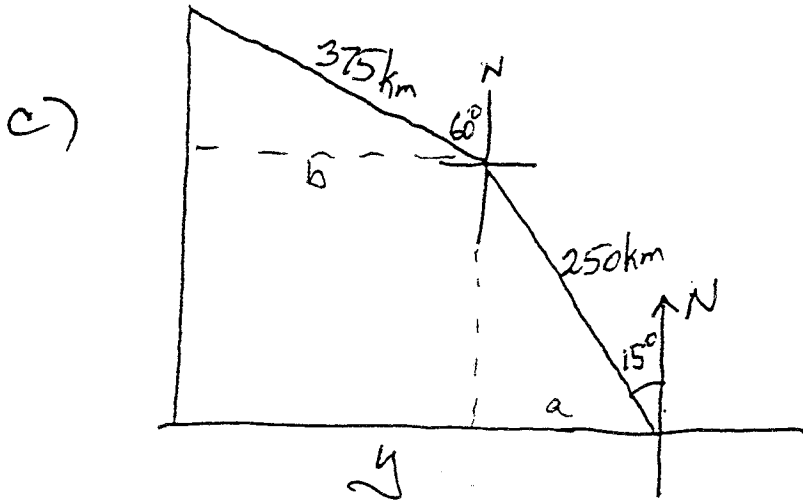
$x = 64.8m$ ③

$x = a - b = 8031m$ ②

QUESTION 6 (8 marks)

a) Bearing of B from A is $345°T$ or $N15°W$ [1]
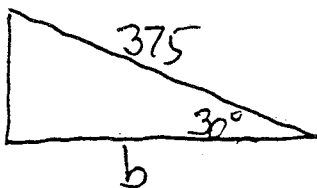
b)

$\tan\theta = \dfrac{48}{36}$

$\theta = 53°$ 1

Bearing is $\underline{037°T}$ or $\underline{N37°E}$ ②

c)

$\cos 75 = \dfrac{a}{250}$

$64.7km = a$ 2

$\cos 30° = \dfrac{b}{375}$

$324.8 = b$ 2

$y = a + b$

$y = 64.7 + 324.8$

$y = 389 \, km$ ⑤