

YEAR ELEVEN FUNCTIONS TEST MAY 2000



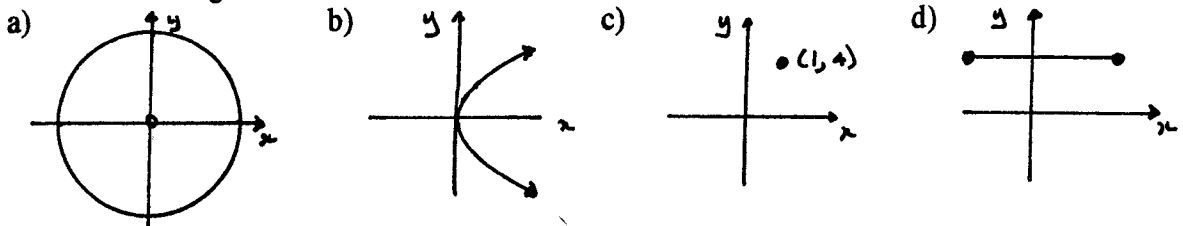
Instructions

- Show all necessary working
- Marks may be deducted for careless or badly arranged work
- Use separate paper

Name _____

Question One (4 marks)

Are the following functions ?



Question Two (3 marks) *working*

Given that $G(x) = -x^2 + 24$ find

- a) $G(2) + G(-2)$
- b) x when $G(x) = -12$

Question Three (6 marks)

Determine the domain and range for each of the following functions

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

Question Four (3 marks)

What domain is to be assumed for the following ;

- a) $f(x) = \frac{x}{x-5}$
- b) $\phi(x) = \sqrt{2x+1} + \sqrt{5-x}$

Question Five (6 marks)

- a) Show that $G(x) = 4x^6 + 3x^4 - x^2 + 1$ is an even function
- b) What is the geometrical significance of an even function ?
- c) What is the geometrical significance of an odd function ?

Question Six (2 marks)

Are the following continuous or discontinuous?



Question Seven (20 marks) Draw sketch graphs of the following showing relevant features

- a) $y = -x^2 + 4$
- b) $y = \frac{-4}{x}$
- c) $y = |x + 4|$
- d) $y = (x + 4)(x - 4)$
- e) $y = x^3$
- f) $xy = 4$
- g) $y = \frac{4}{x^2}$
- h) $y = 4x - 4$
- i) $x^2 + y^2 = 4$
- j) $y = |-x^2 + 4|$

Question Eight (3 marks)
 Determine the asymptotes of

a) $f(x) = \left(\frac{1}{2}\right)^x$

b) $f(x) = \frac{1}{x+2} + 2$

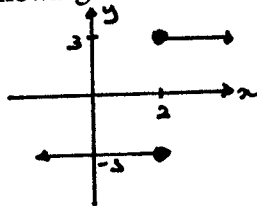
Question Nine (6 marks)

Given $f(x) = \begin{cases} -4 & \text{for } x \geq 2 \\ -x^2 & \text{for } -3 < x < 2 \\ -9 & \text{for } x \leq -3 \end{cases}$

- a) Find ; i) $f(-4)$
 ii) $f(1)$
 iii) $f(2) + f(4)$
 b) Sketch $f(x)$

Question Ten (2 marks)

The following is not a function. Why?



Question Eleven (5 marks)

- Sketch the region represented by ; a) $y < \sqrt{16-x^2}$
 b) the intersection of $y < \sqrt{16-x^2}$ and $y \geq -2$

Question Twelve (4 marks)

- Sketch ; a) $y = x$
 b) $y = |x|$
 c) $y = |x| + x$

Question Thirteen (3 marks)

Show that the equation $x^2 + y^2 + 12x - 8y - 5 = 0$ represents a circle and find its center and radius.

11M 2 Functions Test 2000 Soln's

Q1 a) No b) No c) Yes d) Yes

Q2 $G(x) = -x^2 + 24$

a) $G(2) = -4 + 24$
 $= 20$

$G(-2) = -4 + 24$
 $= 20$

$\therefore G(2) + G(-2) = 20 + 20$
 $= 40$

b) $-12 = -x^2 + 24$

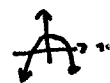
$-36 = -x^2$

$x^2 = 36$, $x = \pm 6$

Q3 a) $y = -2x^2 + 4$, D: all real , R: $y \leq 4$

b) $y = \sqrt{4-x^2}$, D: $-2 \leq x \leq 2$, R: $-2 \leq y \leq 0$

c) $y = 4^x$, D: all real R: $y > 0$

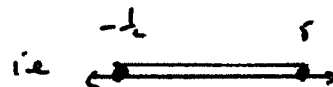


Q4 a) all real except $x = 5$

b) $2x + 1 \geq 0$, $5 - x \geq 0$

$x \geq -\frac{1}{2}$, $x \leq 5$

then $-\frac{1}{2} \leq x \leq 5$: D



Q5 a) $G(x) = 4x^6 + 3x^4 - x^2 + 1$

$G(a) = 4a^6 + 3a^4 - a^2 + 1$

$G(-a) = 4(-a)^6 + 3(-a)^4 - (-a)^2 + 1$

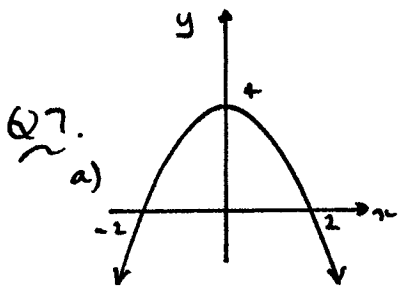
$= 4a^6 + 3a^4 - a^2 + 1$

$= G(a) \quad \therefore G(x) \text{ even}$

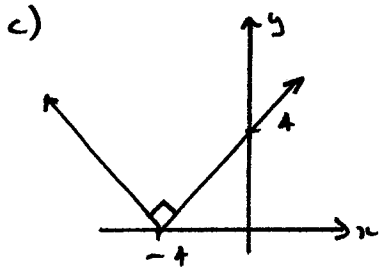
b) It has line symmetry about the y axis

c) " " point " " " origin

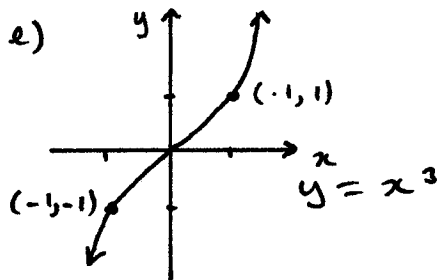
Q6 continuous, discontinuous



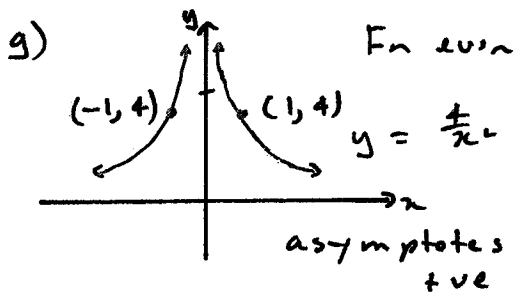
$$y = -x^2 + 4$$



$$y = |x + 4|$$



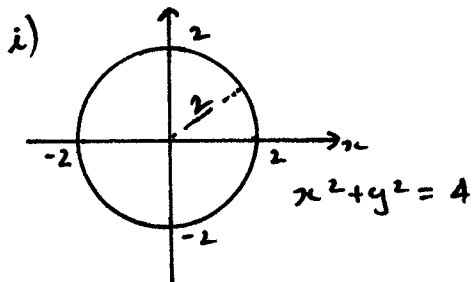
$$y = x^3$$



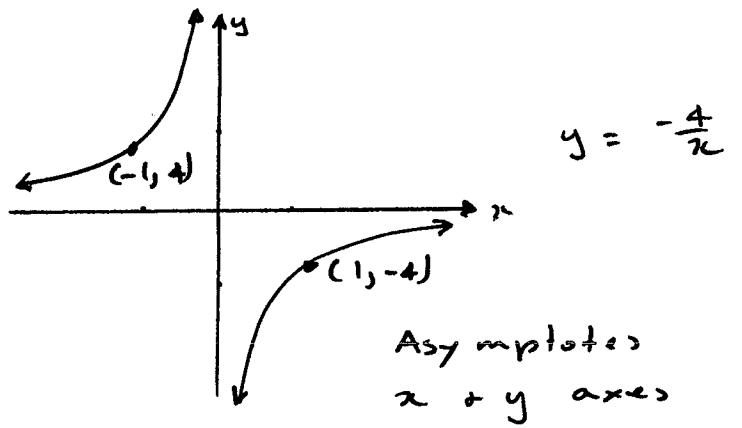
Fn even

$$y = \frac{4}{x}$$

asymptotes x axis
+ve y axis

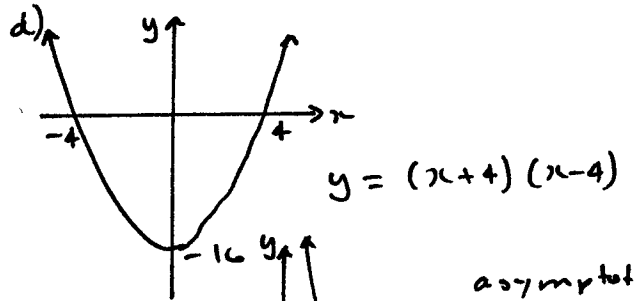


$$x^2 + y^2 = 4$$



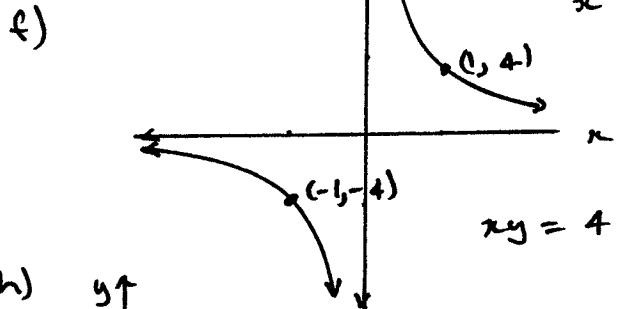
$$y = -\frac{4}{x}$$

Asymptotes
x + y axes

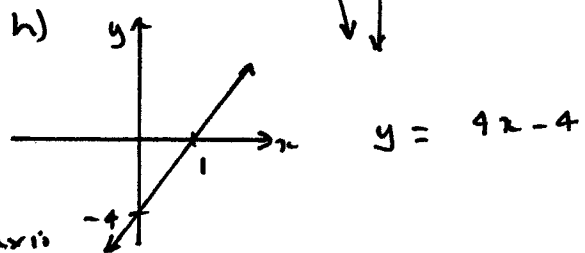


$$y = (x + 4)(x - 4)$$

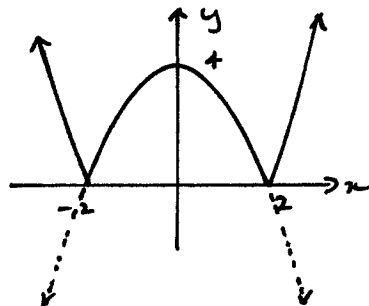
asymptote
x + y axis



$$xy = 4$$



$$y = 4x - 4$$



Q8 a) negative x axis
(y = 0)

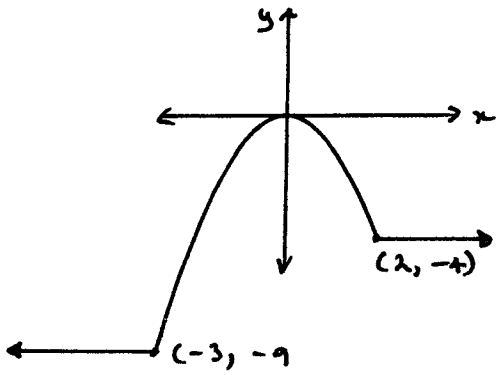
b) x = -2, y = 2

Q9 a) f(-4) = -9

b) f(1) = -(1)^2
= -1

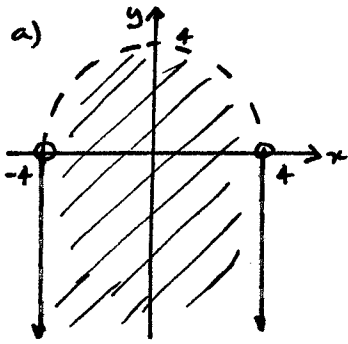
c) f(2) + f(4)
= -4 + -4
= -8

b)

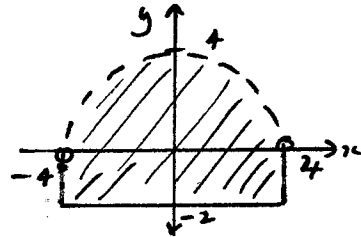


Q10 For $x = 2$ there are two y values ($x = 3$ and $x = -3$)

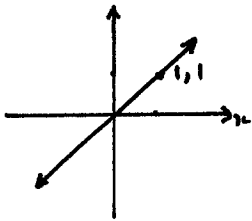
Q11



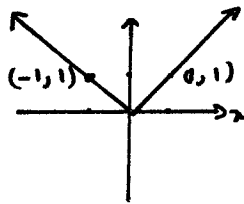
b)



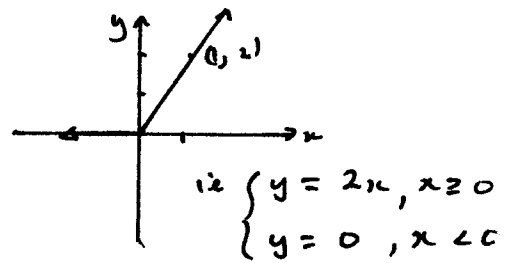
Q12 a) $y = x$



b) $y = |x|$



c) $y = |x| + x$



Q13

$$x^2 + y^2 + 12x - 8y - 5 = 0$$

$$x^2 + 12x + y^2 - 8y = 5$$

$$x^2 + 12x + 36 + y^2 - 8y + 16 = 5 + 36 + 16$$

$$(x+6)^2 + (y-4)^2 = 57$$

ie circle centre $(-6, 4)$ radius $\sqrt{57}$