

SYDNEY TECHNICAL HIGH SCHOOL

MATHEMATICS

2 UNIT

YEAR 11 COMMON TEST 1

MAY 2005

Time Allowed : 70 minutes

Directions to Candidates

- Attempt ALL questions.
- Approximate marks are shown alongside each question.
- All necessary working should be shown in every question. Marks may be deducted for careless or badly arranged work.
- Board-approved calculators may be used.
- At the conclusion of the exam hand in the question paper with your solutions.

Name: _____

Teacher: _____

1	2	3	4	5	6	7	8	Total
/7	/8	/6	/6	/8	/8	/7	/7	/57

Question 1

- a) Evaluate $\frac{7.2}{3.4 \times 10^{-2}}$ to 2 decimal places (1)
- b) Write 7862 correct to 2 significant figures. (1)
- c) Write $a - \frac{a}{b}$ as a single fraction (1)
- d) Simplify $(2\sqrt{3})^3$ (1)
- e) Evaluate $27^{-\frac{2}{3}}$ (1)
- f) Subtract $x^3 - x^2 + 1$ from $2x^2 - 1$ (2)

Question 2

- a) Express $0.\dot{3}\dot{4}$ as a fraction in simplest form (2)
- b) Rationalise the denominator of $\frac{\sqrt{2}}{4 - \sqrt{2}}$ and simplify. (2)
- c) Simplify $\sqrt{\frac{a^2 b^{20}}{b^4}}$ (2)
- d) State the domain and range of $y = x^2 + 1$ (2)

Question 3

Factorise fully:

- a) $xy + x^2 + y + x$ (2)
- b) $y^3 + 8$ (2)

Question 4

a) Simplify $\frac{5x - 4y}{25x^2 - 16y^2}$ (2)

b) If $f(x) = 1 - x^3$ find the value of (i) $f(2)$ (1)

(ii) x , if $f(x) = 65$ (2)

c) Find the y intercept of the parabola $y = x^2 + x + 6$ (1)

Question 5

a) Solve the following:

(i) $\frac{x-4}{3} + 2 = \frac{3x}{5}$ (2)

(ii) $2x^2 - 4x = 0$ (2)

(iii) $|x-1| > 4$ (2)

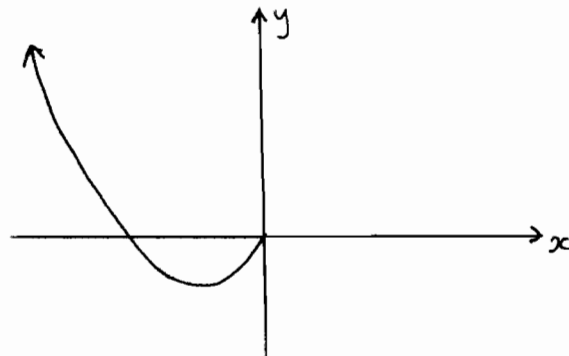
b) State the domain and range for $y = \sqrt{9 - x^2}$ (2)

Question 6

a) Solve $|x+1| = 5 - 3x$ (3)

b) (i) Write the algebraic condition for $y = f(x)$ to be an odd function (1)

(ii) You are given that the curve below represents an odd function



Copy or trace the diagram onto your answer sheet.

Complete the graph given that it is an odd function. (1)

- c) Find the simultaneous solution to $2x + y = 1$ and $xy + 3 = 0$ (3)

Question 7

- a) Sketch the following on separate number planes. Show all important features and intercepts.

Use a ruler for the axes and be neat.

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

(ii) $y = x + 4$ (2)

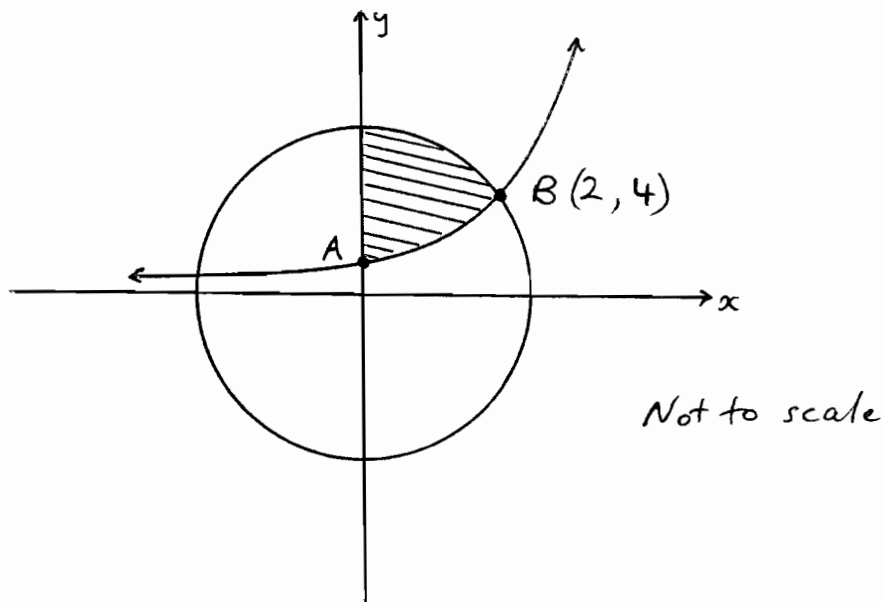
(iii) $y = |x + 2|$ (2)

- b) Use the graphs above, or otherwise, to solve $x + 4 = |x + 2|$ (1)

Question 8

A circle, centre the origin, and an exponential function of the form $y = a^x$ are shown. A & B lie on the curves as shown. B has co-ordinates (2, 4).

Find



- (i) the coordinates of A (1)
(ii) the equation of the circle (2)
(iii) the equation of the exponential function (1)
(iv) Give the three inequations which combine to define the shaded region shown. (3)

2 unit Year 11 Solutions. 2005 (May)

Q1

a) 211.76

b) 7900

c) $\frac{ab-a}{b}$

d) $24\sqrt{3}$

e) $\frac{1}{9} (0.i)$

f) $(2x^2-1) - (x^3-x^2+1)$
 $= 2x^2-1-x^3+x^2-1$
 $= 3x^2-x^3-2$

Q2

a) $x = 0.3444\dots$

$10x = 3.444\dots$

$100x = 34.444\dots$

$x = \frac{31}{90}$

$\therefore 0.3\dot{4} = \frac{31}{90}$

b) $\frac{\sqrt{2}}{4-\sqrt{2}} \times \frac{4+\sqrt{2}}{4+\sqrt{2}}$

$= \frac{4\sqrt{2}+2}{16-2}$

$= \frac{2(2\sqrt{2}+1)}{14}$

$= \frac{2\sqrt{2}+1}{7}$

c) $\sqrt{a^2 b^{16}} = ab^8$

d) D: all real x

R: $y \geq 1$

Q3

a. $x(y+x)+1(y+x)$

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

b. $(y+2)(y^2-2y+4)$

c. $(3a+2)(a-3)$

Q4.

a) $\frac{5x-4y}{(5x-4y)(5x+4y)}$

$= \frac{1}{5x+4y}$

$= \frac{1}{5x+4y}$

b) i. $1-8 = -7$

ii. $65 = 1-x^3$

$x^3 = -64$

$\therefore x = -4$

c. $y = 6$

Q5

a) i. $\frac{x-4}{3} + 2 = \frac{3x}{5}$

$\times 15$

$5(x-4) + 30 = 9x$

$5x-20+30 = 9x$

$-4x = -10$

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

ii. $2x(x-2) = 0$

$x = 0, x = 2$

iii. $|x-1| > 4$

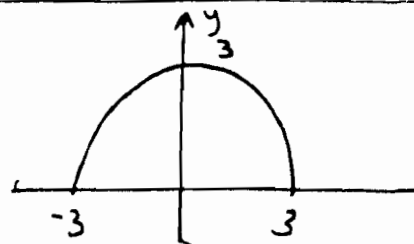
$x-1 > 4$ or $-x+1 > 4$

$x > 5$ $-x > 3$

$x < -3$

$\therefore x < -3$ or $x > 5$

b)



D: $-3 \leq x \leq 3$

R: $0 \leq y \leq 3$

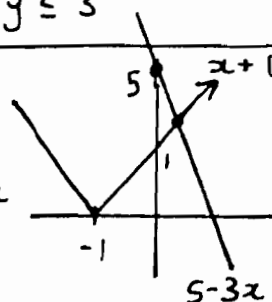
Q6 a)

Solⁿ

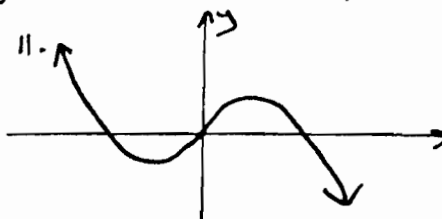
$x+1 = 5-3x$

$4x = 4$

$\therefore x = 1$



b) i. $f(-x) = -f(x)$



c) $2x+y=1$

$y = 1-2x$

$\therefore x(1-2x)+3=0$

$x-2x^2+3=0$

$2x^2-x-3=0$

$(2x-3)(x+1)=0$

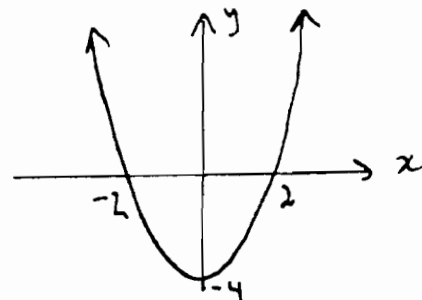
$x = \frac{3}{2}, x = -1$

$\therefore x = 1\frac{1}{2}, y = -2$

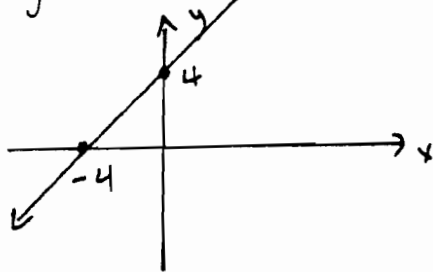
and when $x = -1, y = 3$

7.

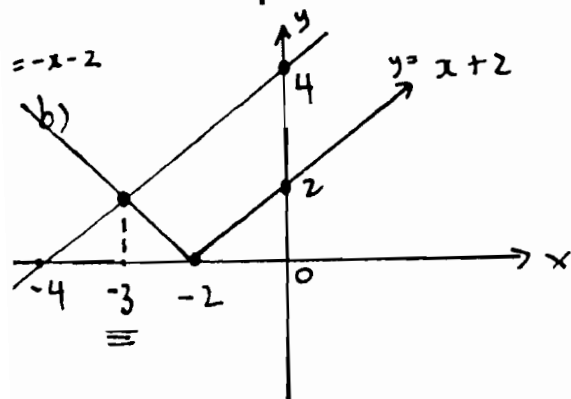
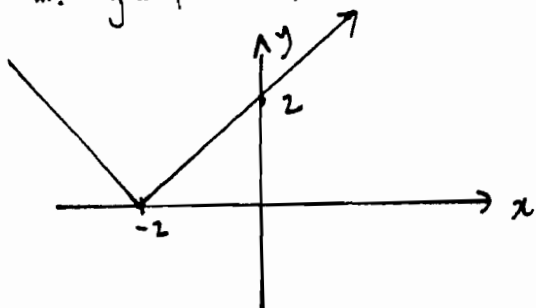
a) $y = x^2 - 4$



11. $y = x + 4$



11. $y = |x + 2|$



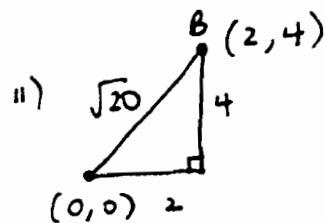
$$-x - 2 = x + 4$$

$$-2x = 6$$

$$\therefore x = -3$$

Q8

i) $A(0, 1)$



$$x^2 + y^2 = r^2$$

$$\therefore x^2 + y^2 = 20$$

ii. $y = a^x$ sub in $(2, 4)$

$$4 = a^2$$

$$\therefore a = 2$$

$$\text{equation} \Rightarrow y = 2^x$$

iv. $x \geq 0$

$$x^2 + y^2 \leq 20$$

$$y \geq 2^x$$