C A 11

KILLARA HIGH SCHOOL

YEAR 11 - 2/3 UNIT MATHS COMMON PAPER - YEARLY EXAMINATION, 1986

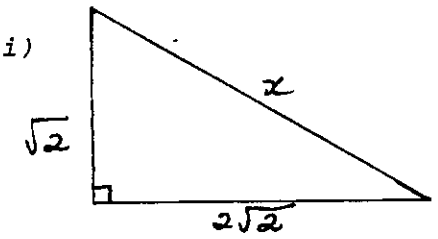
Time Allowed: 3 hours

Show all necessary working.

Question 1

(i) Simplify (a) $3x - (x+5)$ (b) $\sqrt{a^5} \times a\sqrt{a}$ (c) $\frac{(x+h)^2 - x^2}{h}$

(ii)



Evaluate x in simplest surd form

(iii) Find the gradient of the line joining (a, b) and (b, a)

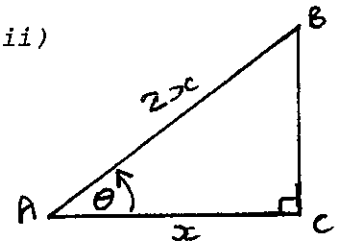
(iv) State the domain and range of the function :

$$y = \sqrt{x-2}$$

Question 2

(i) Solve (a) $\frac{3}{x+2} = 4$ (b) $x^2 \leqslant 4$ (c) $|x + 2| = 7$

(ii)



ABC is a triangle, right-angled at C.
The length of AB is twice the length of AC
(a) How is the length of BC related to the other sides?
(b) Write an expression for the size of $\angle ABC$ in terms of θ.

(iii) Find the equation of the line passing through (0, 5) and parallel to the line $4x - 2y = 1$.

(iv) The volume of a sphere is $16m^3$. Find its radius (correct to 1 decimal place). [Given $V = \frac{4}{3}\pi r^3$].

Question 3

(i) (a) On a number plane, draw the quadrilateral bounded by the lines:

$x = 0$
$y = 0$
$x = 3$
$y = x + 2$

(b) Find the perimeter of this quadrilateral.

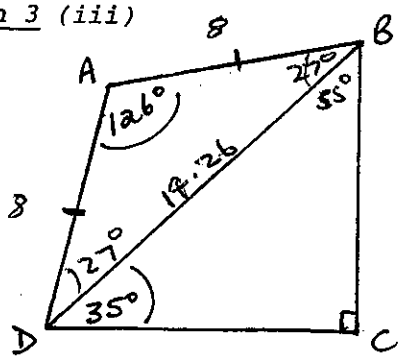
(ii) Given $f(x) = \frac{1-x}{x}$, find $f(\frac{1}{a})$ in simplest form.

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

$\frac{x-1}{1/x}$

2/3u Common Paper Cont'd.

Question 3 (iii)



Given AB = AD = 8 cm, and $\angle DAB = 126^\circ$, and $\angle BDC = 35^\circ$, find

(a) the length of BD; and hence

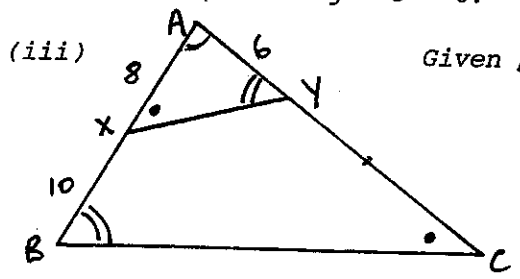
(b) the length of BC.

Question 4: (i) Sketch the graph of $y = 3x - x^2$, and shade the region for which $y \geq 3x - x^2$.

(ii) (a) Find, correct to the nearest minute, the angle of inclination of the line $2x + y - 3 = 0$.

(b) What is the gradient of any line perpendicular to the line $2x + y - 3 = 0$?

(iii)



Given $\angle AXY = \angle YCB$, $\angle AYX = \angle XBC$,

AX = 8 units
XB = 10 units
AY = 6 units
Find the length of CY.

(iv) An exam question reads:

"P is a point on ray OX which bisects $\angle AOB$.

Prove P is equidistant from OA and OB".

Draw a diagram to illustrate this question, showing clearly what is "given", and what is to be proved, but

DO NOT PROVE!

Question 5: (i) Find the derivative of (a) $3x^2 - 7x + 2$

(b) $(3x + 2)^4$

(ii) Differentiate $\frac{2x + 1}{3x - 8}$ using the quotient rule.

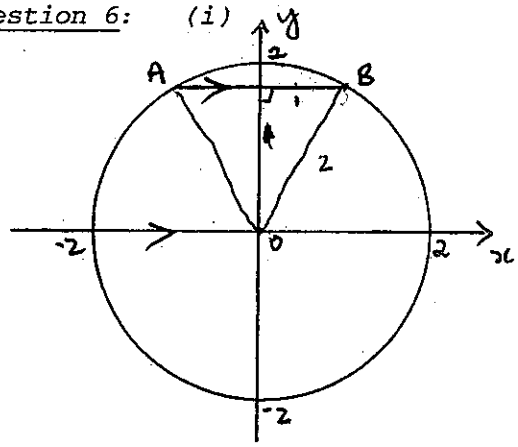
(iii) Find the equation of the tangent to the curve $y = \frac{x^2}{3}$ at the point where $x = 6$.

(iv) Given $f(x) = 4x^{-2}$

evaluate (a) $f(\frac{1}{2})$

(b) $f'(-2)$

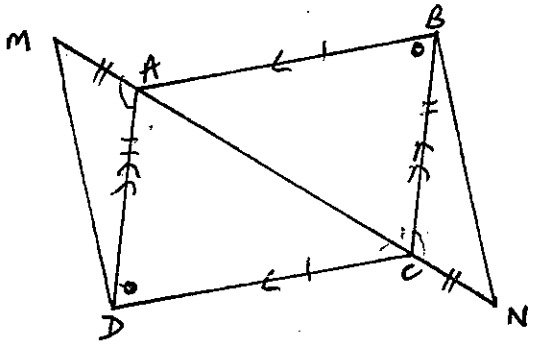
Question 6: (i)



(a) Write down the equation of the circle drawn.

(b) Chord AB is 1 unit in length. Find the co-ordinates of points A and B.

(ii)



ABCD is a parallelogram.

AM = CN. Prove DM = BN.

(iii)(a) Find, from first principles, the gradient at any point (x, y) on the curve $y = \frac{1}{x}$

(b) Hence or otherwise, find the point(s) on the curve $y = \frac{1}{x}$ which have a gradient of -4.

Question 7: (i) Blue metal is distributed by a lorry operating from a base at the beginning of the road. The first load is deposited 400m from the base, the next 500m from the base, and each subsequent load at intervals of 100m. Find the number of kilometres travelled in depositing 23 loads and returning to the base .

(ii) Evaluate $2 + 1 + \frac{1}{2} + \frac{1}{4} + \ldots$

(iii) Solve $x^2 - 5x + 2 = 0$, giving answers correct to 3 significant figures.

(iv) Factorise and simplify $\dfrac{x^3 - 8y^3}{x^2 + 3xy - 10y^2}$

x^{-1}

$-x^{-2}$

$-\frac{1}{x^2}$

Question 8: *A, B, C are the vertices of the triangle bounded by the lines* $y = 2x + 3$, $y = -\frac{1}{2}x + 6$ *and* $y = -\frac{1}{4}x + 3$.

(a) *Find the co-ordinates of A, B and C*

(b) *Show that* Δ *ABC is right-angled.*

(c) *If line AB is the hypotenuse of this triangle, find the distance from the origin to line AB.*

(d) *Draw and clearly label all the above information on a number plane.*

Question 9:

(a) *On the graph paper provided, draw the graph of the curve* $y = \frac{2}{x}$ *for the domain* $-4 \leq x \leq 4$, *using a scale of 1 cm = 1 unit on each axis.*

(b) *Write down the equation(s) of the axes of symmetry of your graph.*

(c) *On the same number plane, draw the graph of* $y = -2x^2$ *for* $-2.5 \leq x \leq 2.5$

(d) *Write down the co-ordinates of the point(s) of intersection of these two graphs.*

(e) *By solving the equations* $y = \frac{2}{x}$ *and* $y = -2x^2$ *simultaneously, verify your answer to (d).*

Question 10: (i) (a) *Find the stationary points on the curve* $y = x^3 - 6x^2 + 9x - 5$, *and determine their nature.*

(b) *Draw a neat sketch of the curve, showing its important features.*

(ii) *Solve* $\sec \frac{\theta}{2} = \sqrt{2}$ *for* $0^\circ \leq \theta \leq 360^\circ$

(iii) *Simplify:* $\sec \theta \, (1 - \sin^2 \theta)$