KILLARA HIGH SCHOOL

YEAR 11 YEARLY EXAMINATION

MATHEMATICS – 2 UNIT

Time Allowed – 2 Hours

INSTRUCTIONS

All questions may be attempted.
In every question, all necessary working should be shown.
Marks will be deducted for careless or badly arranged work.
Each question should be started on a separate sheet of paper.

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1. (12 Marks) Use a separate sheet of paper.

(i) If $(2\sqrt{3} + \sqrt{2})^2 = a + \sqrt{b}$, find a and b.

(ii) Solve $x + \frac{1}{x} = 3$

(iii) Find the sum of the first 100 terms of the arithmetic progression whose first two terms are 100 and 95.

(iv) Use shading to indicate on a diagram the region in which the following inequalities hold simultaneously –

$y + 1 < 0 \qquad x + y - 3 \leqslant 0 \qquad x > 4$

2. (10 Marks) Use a separate sheet of paper.

(i) Write down the derivative of

(a) $2x^3 + 7x$ (b) $(1 + x^2)^3$ (c) $\frac{1}{4x^4}$

(ii) Evaluate $\lim\limits_{x \to 2} \frac{x^2 + 3x - 10}{x - 2}$

(iii) If $y = x^2 - 1$ find $\frac{dy}{dx}$ from first principles

3. (10 Marks) Use a separate sheet of paper.

(i) Given that $\tan \alpha = -\frac{3}{4}$ when $\sin \alpha > 0$, find $\cos \alpha$

(ii) Simplify $\frac{\sin \theta}{1 - \cos \theta} - \frac{\sin \theta}{1 + \cos \theta}$

(iii) The sides of a triangle are 7 cm, 5 cm and 4 cm. Find the size of the angle opposite the largest side.

(iv) Find without using tables, $\sin 210°$.

4. (10 marks) Use a separate sheet of paper.

(i) For the parabola whose equation is $y = 8 + 2x - x^2$

(a) write down the co-ordinates of its vertex
(b) what is the equation of its axis?

(ii) Find the equation of the line through the point (2,0) and the point of intersection of the two lines

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

and

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

(iii) Find the solution of $\{x : |x + 4| = 2\}$

5. (12 Marks) Use a separate sheet of paper.

(i) Find all roots of the equation

$$x^4 - 13x^2 + 36 = 0$$

Contd.Over/

5. (Contd.)

(ii) Find the values of k for which the quadratic equation

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

has equal roots.

(iii) If α and β are the roots of the equation $5x^2 - 20x + 9 = 0$, find $\alpha + \beta$, $\alpha\beta$ and $\frac{1}{\alpha} + \frac{1}{\beta}$

6. (6 Marks) Use a separate sheet of paper.

(i) Find the equation of the tangent to the curve

$$y = x^3 - 9x^2 + 20x - 8$$

at the point $(1,4)$

(ii) At what points on this curve are the tangents parallel to the line $y = -4x + 3$?

7. (10 Marks) Use a separate sheet of paper.

Show that the triangle whose sides satisfy

$$3x + y + 1 = 0, \quad x - 3y + 2 = 0, \quad x + y - 1 = 0$$

is right angled. Find the length of the hypotenuse.
(Give the answer as a surd with integer denominator.)