KILLARA HIGH SCHOOL

YEAR 11 - YEARLY EXAMINATION 1978

Mathematics

2 UNIT COURSE

Time allowed - Three hours

In every question all necessary working should be shown.

Marks will be deducted for careless or badly arranged work.

Mathematical Tables and slide rules may be used. Graph paper will be supplied.

NAME ..... CLASS TEACHER .....

KILLARA HIGH SCHOOL

YEAR 11 - 2 Unit MATHEMATICS Time Allowed: 3 Hours.

All questions may be attempted.
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1. (12 Marks)

(a) Express $0.\dot{5}\dot{1}$ as a rational number in the form $\frac{p}{q}$.

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

(c) Evaluate $\frac{1}{\sqrt{50} - 7}$ without using tables given that $\sqrt{2} = 1.4142$.

(d) Evaluate $\left(\frac{1}{16}\right)^{-\frac{3}{4}}$

(e) Find all solutions of $|x - 3| < 2$.

2. (9 Marks)

(a) Draw a diagram showing the region in which both the following inequalities hold simultaneously

$$x - 3y > 0$$
$$3x + y \geqslant 0$$

(b) What is the equation of the circle whose centre is at the origin and which passes through the point $(5,-7)$?

(c) Draw separate sketches (showing the main features - NOT on graph paper) of

(i) $xy = 1$
(ii) $y = |x|$
(iii) $y = 2^x$

3. (12 Marks)

(a) If $f(x) = x^2$ find $f'(x)$ from 1st principles.

(b) Differentiate

(i) $x^3 + 4x$

(ii) $(2x - 3)^5$

(iii) $\frac{x - 1}{2x + 3}$

(c) Find the equation of the tangent at the point $(1,5)$ on the parabola.

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

Contd.Over/

4. (11 Marks)

(a) For each of the following equations state whether it has solutions and if so find all solutions in the interval

$$0 \leq x \leq 360^{\circ}$$

(i) $2 \sin x + 1 = 0$

(ii) $\sin x + 2 = 0$

(iii) $\sec x - 2 = 0$

(b) Write down the exact values of

(i) $\cos 45^{\circ}$

(ii) $\tan 150^{\circ}$

(iii) $\sin 300^{\circ}$

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

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

5. (12 Marks)

(a) Solve:

(i) $\frac{5 - 3m}{28} + \frac{m - 1}{7} = 0$

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

(b) Simplify $\frac{x^2 - x - 20}{x^2 - 25} \div \frac{x + 1}{x^2 + 5x}$

(c) Simplify $2\sqrt{75} + 3\sqrt{12} - \sqrt{48}$

6. (10 Marks)

(a) For the arithmetic sequence 1,4,7,.....

(i) find the 50th term

(ii) calculate the sum of the first 50 terms.

(b) The first 2 terms of a geometric sequence are 9 and 6.

(i) what is the 3rd term?

(ii) What is the nth term?

(c) A plant is 50cm high when first observed. In the first week of observation, it grows 10 cm and in each succeeding week the growth in height is 80% of the previous week's growth. If this pattern continues what will be its ultimate height?

7. (11 Marks)

(a) Show that the points (2,7), (5,13) and (-4,-5) are collinear.

(b) Show that the line

$$3x + 4y + 10 = 0$$

is a tangent to the circle whose centre is the origin and radius is 2 units.

(c) Find the co-ordinates of the point that divides the interval joining (-2,3) and (3,-7) internally in the ratio 3:2.

(d) Find the equation of the line passing through the point (2,7) and parallel to the line $2x - 3y = 8$.

/Over

8. (12 Marks)

(a) For what values of k does the equation $x^2 + (k-3)x + k = 0$ have real roots.

(b) For what values of k is the expression $x^2 + (k-3)x + k$ positive for all values of x?

(c) Find all roots of the equation $x^4 - 13x^2 + 36 = 0$

(d) Sketch $y = x^2 - 2x - 3$ showing all essential features.

9. (5 Marks)

A field is triangular, with sides of 80 metres and 40 metres enclosing an angle of 120°.

(a) Calculate the area of the field.

(b) Use the cosine rule to calculate the length of the third side to the nearest metre.

10. (6 Marks)

Show that the triangle whose sides satisfy

$$2x - y = 0, \quad x + 2y = 5, \quad x - 3y = 20$$

is isosceles and right angled.