KAMBALA CHURCH OF ENGLAND GIRLS' SCHOOL

HALF-YEARLY TEST

# MATHEMATICS

YEAR 11

3 UNIT

*TIME ALLOWED: 1 HOUR*
*READING TIME: 5 MINUTES*
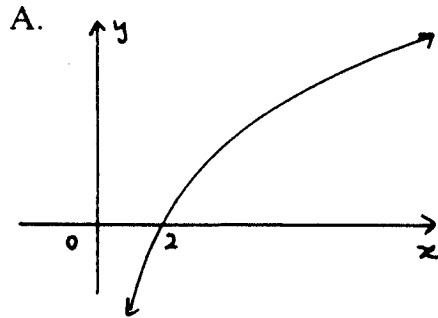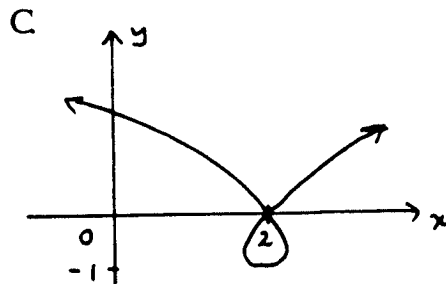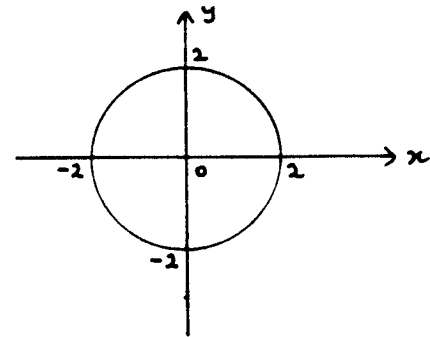
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INSTRUCTIONS:

1. All questions may be attempted.
2. In every question, all necessary working must be shown.
3. Marks will be deducted for careless or badly arranged work.
4. Non programmable, silent calculators and accepted geometrical instruments may be used.
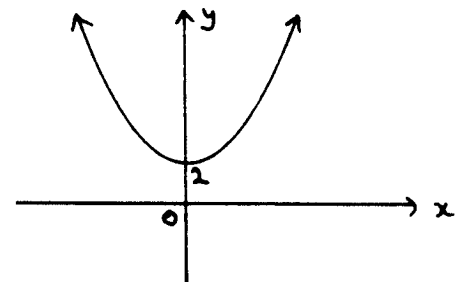5. Begin each question on a new page.

## QUESTION 1

a)  (i)  Which of the graphs below represent a function?

A. 

B. 

C. 

D. 

(ii)  State the range for each of the graphs A, B, C, D.

b)  Using at least half a page, sketch

$$y = \frac{2}{x+3}$$

c)  A function is defined as follows:

$$f(x) = x+1 \quad \text{when} \quad x < -3$$
$$= -1 \quad \text{when} \quad -3 \leq x \leq 1$$
$$= x^2 \quad \text{when} \quad x > 1$$

**Evaluate**

$f(0) + f(-5) - f(2)$

## QUESTION 2    (Start a new page)

a)    Simplify the following trigonometric expressions

   (i)        $\dfrac{\cos(180° + A)}{\sin(90° - A)}$

   (ii)       $\sin^3\theta + \sin\theta\cos^2\theta$

   (iii)      $2\cos^2 150° - 1$

b)    Prove the following trigonometric identity

   $$\dfrac{1 + \cot\theta}{\csc\theta} - \dfrac{\sec\theta}{\tan\theta + \cot\theta} = \cos\theta$$

## QUESTION 3    (Start a new page)

a)    Solve the following equations for x.

   (i)   $\left|x - 1\right| + \left|x - 3\right| = 8$

   (ii)  $\dfrac{4x - 3}{2x + 1} < 3$

b)    Solve the following equations for $0° \leqslant \theta \leqslant 360°$

   (i)    $\sin\theta + 3\cos\theta = 0$

   (ii)   $\tan^2\theta + \tan\theta - 2 = 0$

   (iii)  $5\cos^2\theta + 2\sin\theta = 2$

## QUESTION 4    (Start a new page)

a)    Given $F(x) = (x + 1)(x - 1)$,   simplify   $\dfrac{F(x^2)}{x - 1}$

b)    Two buildings of equal height are 40m apart.  At a point on the horizontal line joining their feet the angles of elevation of the tops of the buildings are $47^\circ$ and $28^\circ$.

(i)    Show that the height, h, of the buildings is given by

$$h = \frac{40\tan 47^\circ \tan 28^\circ}{\tan 47^\circ + \tan 28^\circ}$$

(ii)   Calculate h correct to 2 decimal places.

c)    Find the equation of the diameter of the circle $(x+1)^2 + (y+2)^2 = 16$ which passes through the point of intersection of the lines $2x - y = 5$ and $x + 3y - 3 = 0$.

## END OF PAPER