

# The Bridge to A level

# Diagnosis



## 1 Solving quadratic equations

### Question 1

Solve  $x^2 + 6x + 8 = 0$  (2)

### Question 2

Solve the equation  $y^2 - 7y + 12 = 0$

Hence solve the equation  $x^4 - 7x^2 + 12 = 0$  (4)

### Question 3

(i) Express  $x^2 - 6x + 2$  in the form  $(x-a)^2 - b$  (3)

(ii) State the coordinates of the minimum value on the graph of  $y = x^2 - 6x + 2$  (1)

**Total / 10**

## 2 Changing the subject

### Question 1

Make  $v$  the subject of the formula  $E = \frac{1}{2}mv^2$  (3)

### Question 2

Make  $r$  the subject of the formula  $V = \frac{4}{3}\pi r^2$  (3)

### Question 3

Make  $c$  the subject of the formula  $P = \frac{c}{c+4}$  (4)

**Total / 10**

### 3 Simultaneous equations

#### Question 1

Find the coordinates of the point of intersection of the lines  $y = 3x + 1$  and  $x + 3y = 6$  (3)

#### Question 2

Find the coordinates of the point of intersection of the lines  $5x + 2y = 20$  and  $y = 5 - x$  (3)

#### Question 3

Solve the simultaneous equations

$$x^2 + y^2 = 5$$

$$y = 3x + 1$$

(4)

**Total / 10**

### 4 Surds

#### Question 1

(i) Simplify  $(3 + \sqrt{2})(3 - \sqrt{2})$  (2)

(ii) Express  $\frac{1 + \sqrt{2}}{3 - \sqrt{2}}$  in the form  $a + b\sqrt{2}$  where  $a$  and  $b$  are rational (3)

#### Question 2

(i) Simplify  $5\sqrt{8} + 4\sqrt{50}$ . Express your answer in the form  $a\sqrt{b}$  where  $a$  and  $b$  are integers and  $b$  is as small as possible. (2)

(ii) Express  $\frac{\sqrt{3}}{6 - \sqrt{3}}$  in the form  $p + q\sqrt{3}$  where  $p$  and  $q$  are rational (3)

**Total / 10**

## 5 Indices

### Question 1

Simplify the following

- (i)  $a^0$  (1)
- (ii)  $a^6 \div a^{-2}$  (1)
- (iii)  $(9a^6b^2)^{-0.5}$  (3)

### Question 2

- (i) Find the value of  $\left(\frac{1}{25}\right)^{-0.5}$  (2)
- (ii) Simplify  $\frac{(2x^2y^3z)^5}{4y^2z}$  (3)

**Total / 10**

## 6 Properties of Lines

### Question 1

A (0,2), B (7,9) and C (6,10) are three points.

- (i) Show that AB and BC are perpendicular (3)
- (ii) Find the length of AC (2)

### Question 2

Find, in the form  $y = mx + c$ , the equation of the line passing through A (3,7) and B (5,-1).

Show that the midpoint of AB lies on the line  $x + 2y = 10$  (5)

**Total / 10**

**7**      **Sketching curves**

**Question 1**

In the cubic polynomial  $f(x)$ , the coefficient of  $x^3$  is 1. The roots of  $f(x) = 0$  are -1, 2 and 5.

Sketch the graph of  $y = f(x)$

(3)

**Question 2**

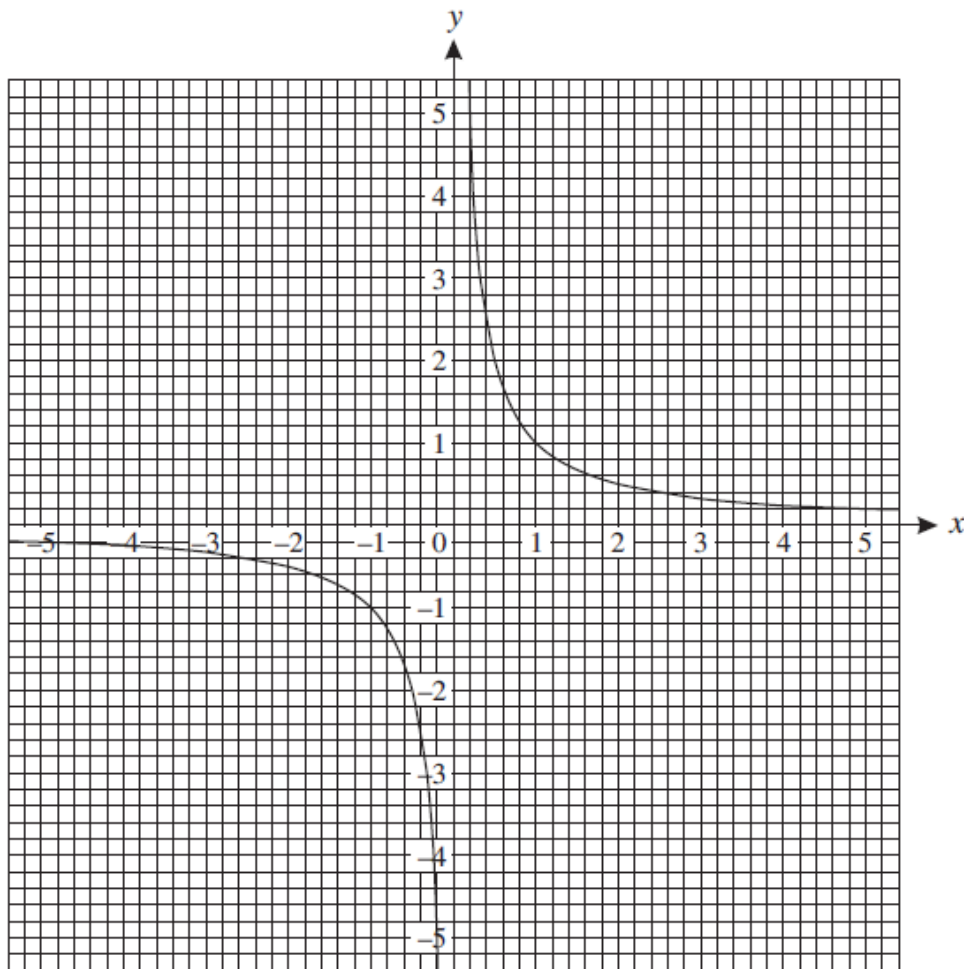
Sketch the graph of  $y = 9 - x^2$

(3)

**Question 3**

The graph below shows the graph of  $y = \frac{1}{x}$

On the same axes plot the graph of  $y = x^2 - 5x + 5$  for  $0 \leq x \leq 5$



(4)

**Total / 10**

## 8 Transformation of functions

### Question 1

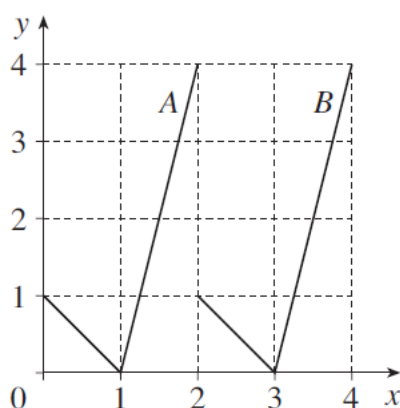
The curve  $y = x^2 - 4$  is translated by  $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$

Write down an equation for the translated curve. You need not simplify your answer.

(2)

### Question 2

This diagram shows graphs A and B.



(i) State the transformation which maps graph A onto graph B

(2)

(ii) The equation of graph A is  $y = f(x)$ .

Which one of the following is the equation of graph B ?

$y = f(x) + 2$

$y = f(x) - 2$

$y = f(x+2)$

$y = f(x-2)$

$y = 2f(x)$

$y = f(x+3)$

$y = f(x-3)$

$y = 3f(x)$

(2)

### Question 3

(i) Describe the transformation which maps the curve  $y = x^2$  onto the curve  $y = (x+4)^2$

(2)

(ii) Sketch the graph of  $y = x^2 - 4$

(2)

**Total / 10**

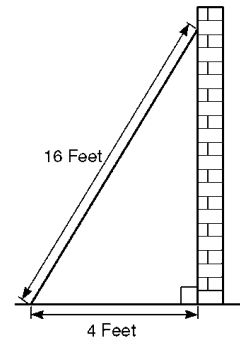


**9**                      **Trigonometric ratios**

**Question 1**

Sidney places the foot of his ladder on horizontal ground and the top against a vertical wall.

The ladder is 16 feet long.



The foot of the ladder is 4 feet from the base of the wall.

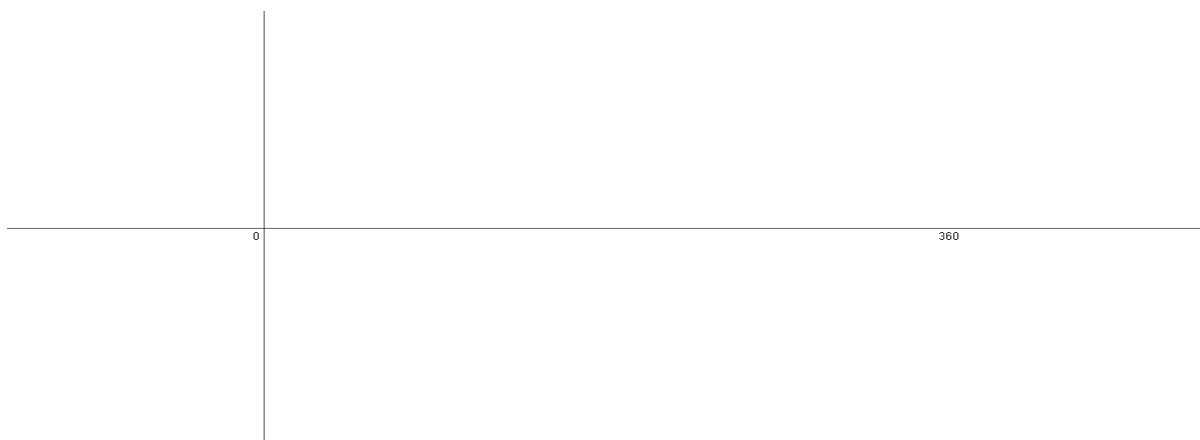
- (i)     Work out how high up the wall the ladder reaches. Give your answer to 3 significant figures. (2)
- (ii)   Work out the angle the base of the ladder makes with the ground. Give your answer to 3 significant figures (2)

**Question 2**

Given that  $\cos \Theta = \frac{1}{3}$  and  $\Theta$  is acute, find the exact value of  $\tan \Theta$  (3)

**Question 3**

Sketch the graph of  $y = \cos x$  for  $0 \leq x \leq 360^\circ$

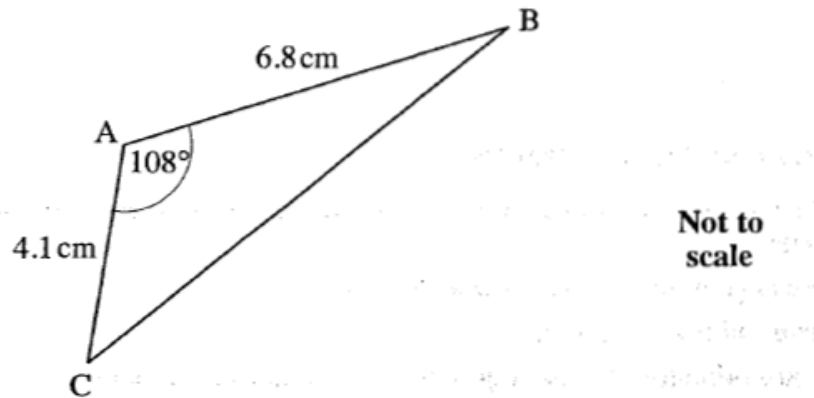


(3)

**Total / 10**

**10**      **Sine / Cosine Rule**

**Question 1**

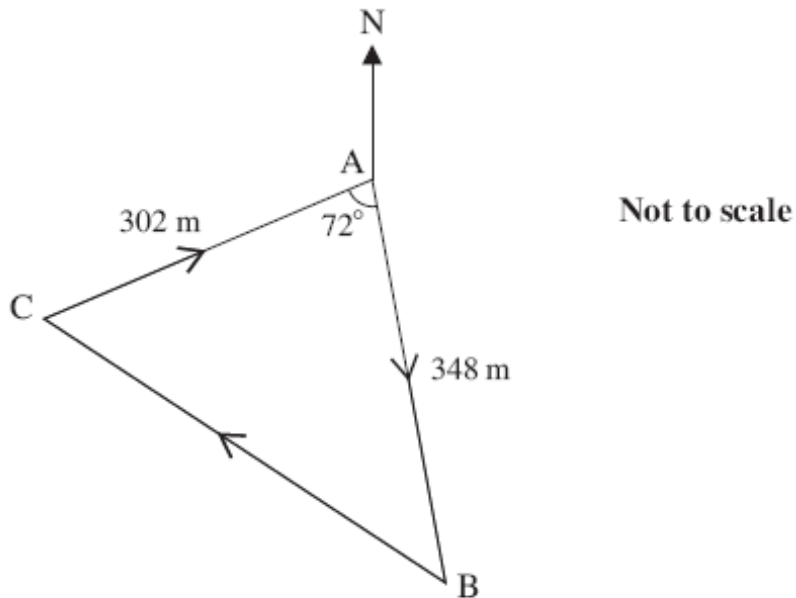


For triangle ABC, calculate

- (i) the length of BC (3)
- (ii) the area of triangle ABC (3)

**Question 2**

The course for a yacht race is a triangle as shown in the diagram below. The yachts start at A, then travel to B, then to C and finally back to A.



Calculate the total length of the course for this race. (4)

**Total / 10**