

L6 Mathematics Mock

Paper 2 (Teacher Y)

January 2020

2019-2020

Duration: 1 hour

Total number of marks: 48

Write your answers on file paper.

You are permitted to use a scientific or graphical calculator in this paper.

Final answers should be given to a degree of accuracy appropriate to the context.

Relevant information from the formula booklet is given below:

Formulae

AS Level Mathematics A (H230)

Binomial series

$$(a+b)^n = a^n + {}^n C_1 a^{n-1}b + {}^n C_2 a^{n-2}b^2 + \dots + {}^n C_r a^{n-r}b^r + \dots + b^n \quad (n \in \mathbb{N}),$$

$$\text{where } {}^n C_r = \binom{n}{r} = \frac{n!}{r!(n-r)!}$$

Differentiation from first principles

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

1.

Solve the simultaneous equations

$$y = x^2 - 6x, \quad 2y + x - 6 = 0. \quad [5]$$

2.

The line l_1 has equation $4y - 3x = 10$

The line l_2 passes through the points $(5, -1)$ and $(-1, 8)$.

Determine, giving full reasons for your answer, whether lines l_1 and l_2 are parallel, perpendicular or neither.

(4)

3.

(a) Sketch the curve $y = g(x)$ where

$$g(x) = (x + 2)(x - 1)^2$$

[3 marks]

(b) Hence, solve $g(x) \leq 0$

[2 marks]

4.

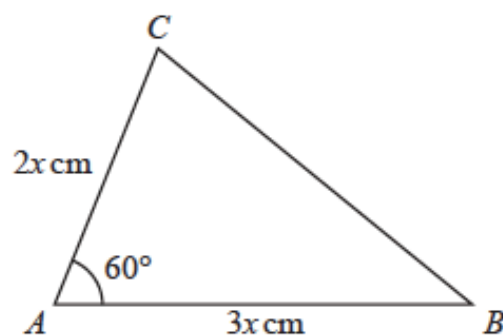


Figure 1

Figure 1 shows a sketch of a triangle ABC with $AB = 3x$ cm, $AC = 2x$ cm and angle $CAB = 60^\circ$

Given that the area of triangle ABC is $18\sqrt{3}$ cm²

(a) show that $x = 2\sqrt{3}$

(3)

(b) Hence find the exact length of BC , giving your answer as a simplified surd.

(3)

5.

Show in a sketch the region of the x - y plane within which all three of the following inequalities are satisfied.

$$3y \geq 4x \quad y - x \leq 1 \quad y \geq (x-1)^2$$

You should indicate the region for which the inequalities hold by labelling the region R.

[4]

6.

(a) Find the first 3 terms, in ascending powers of x , of the binomial expansion of

$$\left(2 + \frac{3x}{4}\right)^6$$

giving each term in its simplest form.

(4)

(b) Explain how you could use your expansion to estimate the value of 1.925^6
You do not need to perform the calculation.

(1)

7.

The circle C has equation

$$x^2 + y^2 - 6x + 10y + 9 = 0$$

(a) Find

(i) the coordinates of the centre of C

(ii) the radius of C

(3)

The line with equation $y = kx$, where k is a constant, cuts C at two distinct points.

(b) Find the range of values for k .

(6)

8.

$$f(x) = 2x^3 - 13x^2 + 8x + 48$$

(a) Prove that $(x - 4)$ is a factor of $f(x)$.

(2)

(b) Hence, using algebra, show that the equation $f(x) = 0$ has only two distinct roots.

(4)

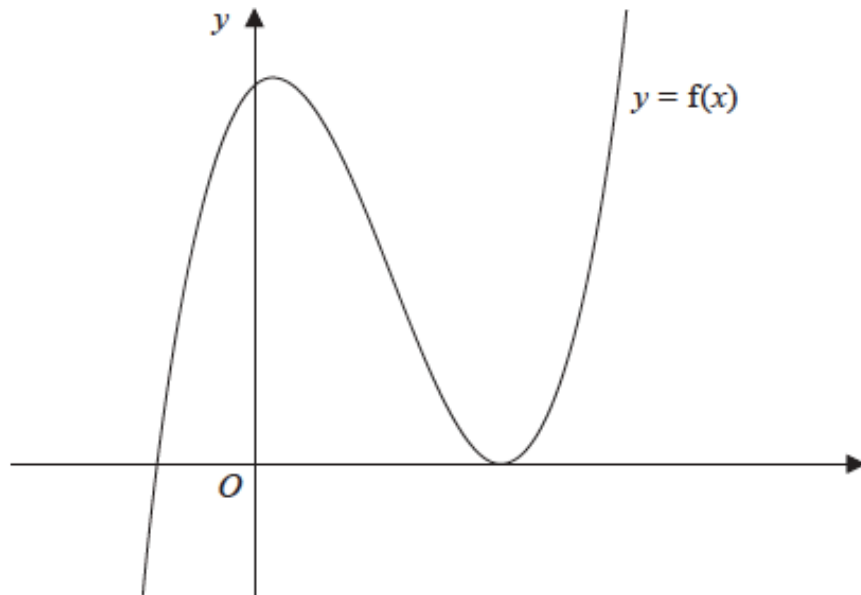


Figure 2

Figure 2 shows a sketch of part of the curve with equation $y = f(x)$.

(c) Deduce, giving reasons for your answer, the number of real roots of the equation

$$2x^3 - 13x^2 + 8x + 46 = 0$$

(2)

Given that k is a constant and the curve with equation $y = f(x + k)$ passes through the origin,

(d) find the two possible values of k .

(2)