2. **In this question you must show all stages of your working.**

Solutions relying on calculator technology are not acceptable.

(a) Solve

$$5(x + 3) > 4(2x - 5)$$

(2)

(b) (i) Write

$$x^2 - 6x + 1$$

in the form $(x + a)^2 + b$ where a and b are constants.

(ii) Hence solve

$$x^2 - 6x + 1 \geqslant 0$$

(4)

(c) Hence find the values of x that satisfy both

$$5(x + 3) > 4(2x - 5) \quad \textbf{and} \quad x^2 - 6x + 1 \geqslant 0$$

(1)

DO NOT WRITE IN THIS AREA

DO NOT WR

7. (a) Sketch the graph of the curve C with equation

$$y = \frac{4}{x - k}$$

where k is a positive constant.

Show on your sketch

- the coordinates of any points where C cuts the coordinate axes
- the equation of the vertical asymptote to C

(4)

Given that the straight line with equation $y = 9 - x$ does not cross or touch C

(b) find the range of values of k.

(5)

DO NOT WRITE IN THIS AREA

10. **In this question you must show all stages of your working.**

The curve C has equation $y = f(x), x > 0$

Given that

- the point $P(2, 8\sqrt{2})$ lies on C
- $f'(x) = 4\sqrt{x^3} + \frac{k}{x^2}$ where k is a constant
- $f''(x) = 0$ at P

(a) find the exact value of k,

(4)

(b) find $f(x)$, giving your answer in simplest form.

(4)

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9. Given that

- the point A has coordinates (4, 2)
- the point B has coordinates (15, 7)
- the line l_1 passes through A and B

(a) find an equation for l_1, giving your answer in the form $px + qy + r = 0$ where p, q and r are integers to be found.

(3)

The line l_2 passes through A and is parallel to the x-axis.

The point C lies on l_2 so that the length of BC is $5\sqrt{5}$

(b) Find both possible pairs of coordinates of the point C.

(4)

(c) Hence find the minimum possible area of triangle ABC.

(2)

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10.

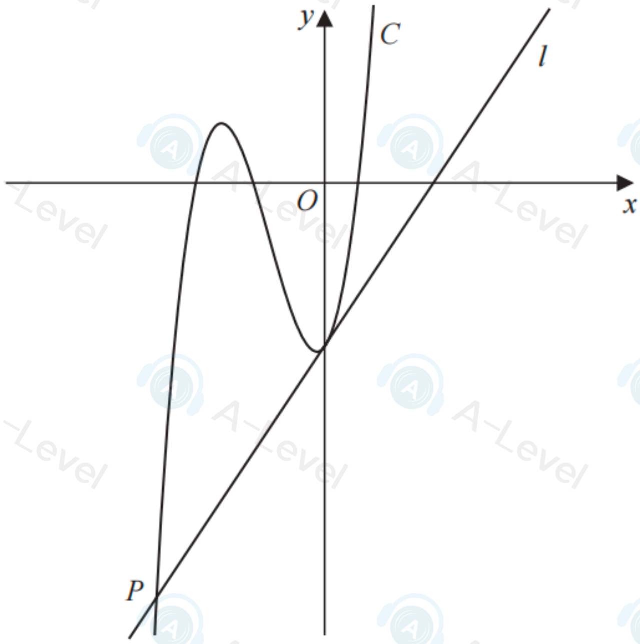

Figure 4

Figure 4 shows a sketch of part of the curve C with equation $y = f(x)$, where

$$f(x) = (3x + 20)(x + 6)(2x - 3)$$

(a) Use the given information to state the values of x for which

$$f(x) > 0$$

(2)

(b) Expand $(3x + 20)(x + 6)(2x - 3)$, writing your answer as a polynomial in simplest form.

(3)

DO NOT WRITE IN THIS AREA

4.

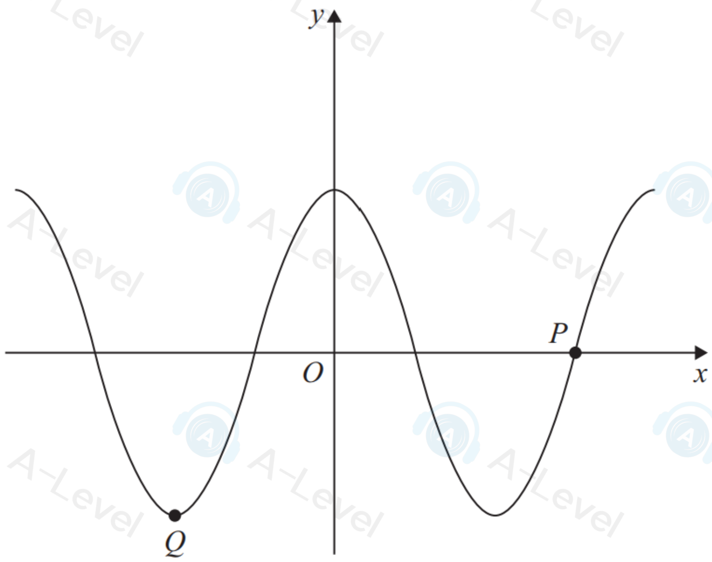

Figure 1

Figure 1 shows a sketch of part of the curve with equation

$$y = 4\cos x$$

where x is measured in degrees.

The points P and Q lie on the curve and are shown in Figure 1.

(a) State the coordinates of P.

(1)

(b) State the coordinates of Q.

(2)

(c) State the **number** of solutions of the equation

(i) $4\cos x = 3$ in the interval $0 < x \leqslant 18\,000°$

(ii) $5 + 4\cos x = 1$ in the interval $-720° < x \leqslant 720°$

(iii) $4\cos x - 3 = 1$ in the interval $-1080° \leqslant x \leqslant 1080°$

(3)

2. The curve C has equation

$$y = 2x^{\frac{5}{2}} - 4x + 3$$

(a) Find $\dfrac{\mathrm{d}y}{\mathrm{d}x}$ writing your answer in simplest form.

(2)

The point P lies on C.

Given that

- the x coordinate of P is 2^k where k is a constant
- the gradient of C at the point P is 16

(b) find the value of k.

(3)