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

Solutions relying on calculator technology are not acceptable.

(a) Write $\dfrac{8-\sqrt{15}}{2\sqrt{3}+\sqrt{5}}$ in the form $a\sqrt{3}+b\sqrt{5}$ where a and b are integers to be found.

(3)

(b) Hence, or otherwise, solve

$$\left(x+5\sqrt{3}\right)\sqrt{5} = 40 - 2x\sqrt{3}$$

giving your answer in simplest form.

(3)

1.

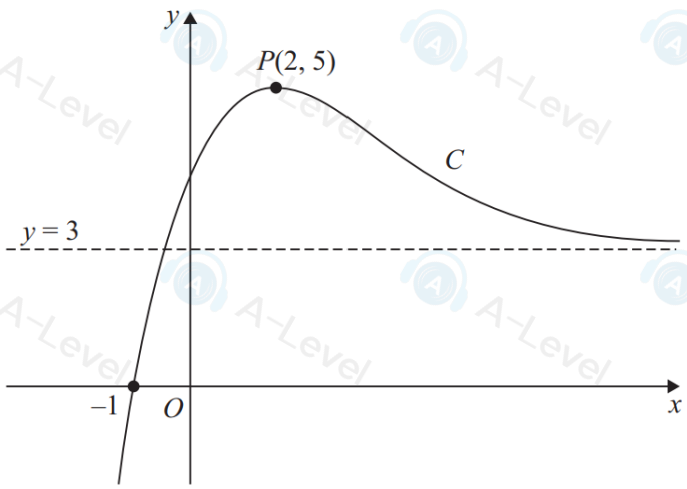

Figure 1

The curve C, shown in Figure 1,

- has equation $y = f(x), x \in \mathbb{R}$
- cuts the x-axis at -1
- has a maximum turning point at $P(2, 5)$
- has a horizontal asymptote with equation $y = 3$

The curve C has no other turning points or asymptotes.

(a) Find the coordinates of the point to which P is transformed when the curve with equation $y = f(x)$ is transformed to the curve with equation

(i) $y = f(x) + 7$

(ii) $y = 3f(x)$

(2)

Given that the line with equation $y = k$, where k is a constant, cuts or meets C exactly once,

(b) state the range of possible values of k.

(2)

(c) Write down the solution of the equation

$$f(x + 4) = 0$$

(1)

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2. Given

$$\frac{3^x}{3^{4y}} = 27\sqrt{3}$$

find y as a simplified function of x.

(3)

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2. Given that

$$a = \frac{1}{64}x^2 \qquad b = \frac{16}{\sqrt{x}}$$

express each of the following in the form kx^n where k and n are simplified constants.

(a) $a^{\frac{1}{2}}$

(1)

(b) $\frac{16}{b^3}$

(1)

(c) $\left(\frac{ab}{2}\right)^{-\frac{4}{3}}$

(2)

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