6. (i) A student investigates a curve with equation $y = f(x)$.

The student finds that $f(4) = 0.98$ and $f(5) = 4.2$

The student concludes that the equation $f(x) = 0$ has **no** roots between $x = 4$ and $x = 5$
Explain why the student might **not** be correct.

(1)

(ii) Figure 2 on page 13 shows a plot of a different curve with equation $y = g(x)$, where

$$g(x) = \frac{5}{2}x^2 - e^x + 4$$

(a) Find $g'(x)$

(2)

The curve crosses the x-axis at $x = \alpha$, where $3 < \alpha < 4$

(b) Starting with $x_0 = 4$ apply the Newton–Raphson method once to $g(x)$ to obtain a second approximation to α

Show your working and give your answer to 3 significant figures.

(2)

(c) Draw an appropriate line on Figure 2 to show that the Newton–Raphson method starting with $x_0 = 2$ does **not** give a good second approximation to α
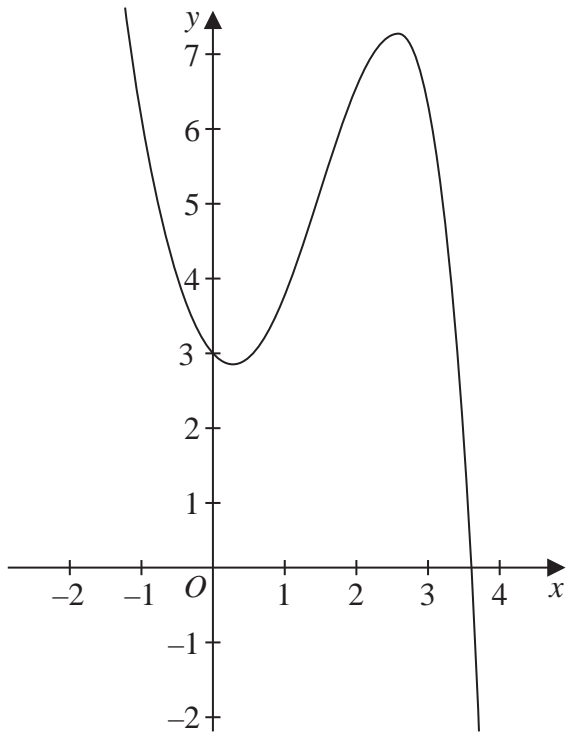
(1)

Figure 2