3. $f(x) = x^3 - 5\sqrt{x} - 4x + 7 \qquad x \geqslant 0$

The equation $f(x) = 0$ has a root α in the interval [0.25, 1]

(a) Use linear interpolation once on the interval [0.25, 1] to determine an approximation to α, giving your answer to 3 decimal places.

(3)

The equation $f(x) = 0$ has another root β in the interval [1.5, 2.5]

(b) Determine $f'(x)$

(2)

(c) Hence, using $x_0 = 1.75$ as a first approximation to β, apply the Newton–Raphson process once to $f(x)$ to determine a second approximation to β, giving your answer to 3 decimal places.

(2)

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Question 3 continued

(Total for Question 3 is 7 marks)