4.

$$f(x) = 1 - \frac{1}{8x^4} + \frac{2}{7\sqrt{x^7}} \qquad x > 0$$

The equation $f(x) = 0$ has a single root, α, that lies in the interval $[0.15, 0.25]$

(a) (i) Determine $f'(x)$

(ii) Explain why 0.25 cannot be used as an initial approximation for α in the Newton-Raphson process.

(iii) Taking 0.15 as a first approximation to α apply the Newton-Raphson process once to $f(x)$ to obtain a second approximation to α
Give your answer to 3 decimal places.

(5)

(b) Use linear interpolation once on the interval $[0.15, 0.25]$ to find another approximation to α
Give your answer to 3 decimal places.

(3)

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Question 4 continued

(Total for Question 4 is 8 marks)