Newton-Raphson Method Exam Questions (Edexcel)

Q1.

$$f(x) = \ln(2x - 5) + 2x^2 - 30, \quad x > 2.5$$

(a) Show that f(x) = 0 has a root α in the interval [3.5, 4]

(2)

A student takes 4 as the first approximation to α.

Given f(4) = 3.099 and f '(4) = 16.67 to 4 significant figures,

(b) apply the Newton-Raphson procedure once to obtain a second approximation for α, giving your answer to 3 significant figures.

(2)

(c) Show that α is the only root of f(x) = 0

(2)

(Total for question = 6 marks)

(**Q08 9MA0/01, Specimen papers**)

Q2.

$$f(x) = x^3 - \frac{5}{2x^{\frac{3}{2}}} + 2x - 3, \quad x > 0$$

(a) Show that the equation f(x) = 0 has a root α in the interval [1.1, 1.5]

(2)

(b) Find f '(x).

(2)

(c) Using x_0 = 1.1 as a first approximation to α, apply the Newton-Raphson procedure once to f(x) to find a second approximation to α, giving your answer to 3 decimal places.

(3)

(Total 7 marks)

(**Q36 6667/01, June 2014**)

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Q3.

$$f(x) = x^2 + \frac{3}{4\sqrt{x}} - 3x - 7, \quad x > 0$$

A root α of the equation f (*x*) = 0 lies in the interval [3, 5].

Taking 4 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 2 decimal places.

(6)

(Total 6 marks)

(**Q35 6667/01, June 2012**)

Q4.

$$f(x) = x + \tan\left(\frac{1}{2}x\right) \qquad \pi < x < \frac{3\pi}{2}$$

Given that the equation f(*x*) = 0 has a single root α

(a) show that α lies in the interval [3.6, 3.7]

(2)

(b) Find f'(*x*)

(2)

(c) Using 3.7 as a first approximation for α, apply the Newton–Raphson method once to obtain a second approximation for α. Give your answer to 3 decimal places.

(2)

(Total for question = 6 marks)

(**Q03 9MA0/01, June 2024**)

Q5.

$$f(x) = 3\sqrt{x} + \frac{18}{\sqrt{x}} - 20$$

(a) Show that the equation f(*x*) = 0 has a root *α* in the interval [1.1, 1.2].

(2)

(b) Find f '(*x*).

(3)

(c) Using x_0 = 1.1 as a first approximation to *α*, apply the Newton-Raphson procedure once to f(*x*) to find a second approximation to *α*, giving your answer to 3 significant figures.

(4)

(Total 9 marks)

(**Q32 6667/01, Jan 2009**)

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Q6.

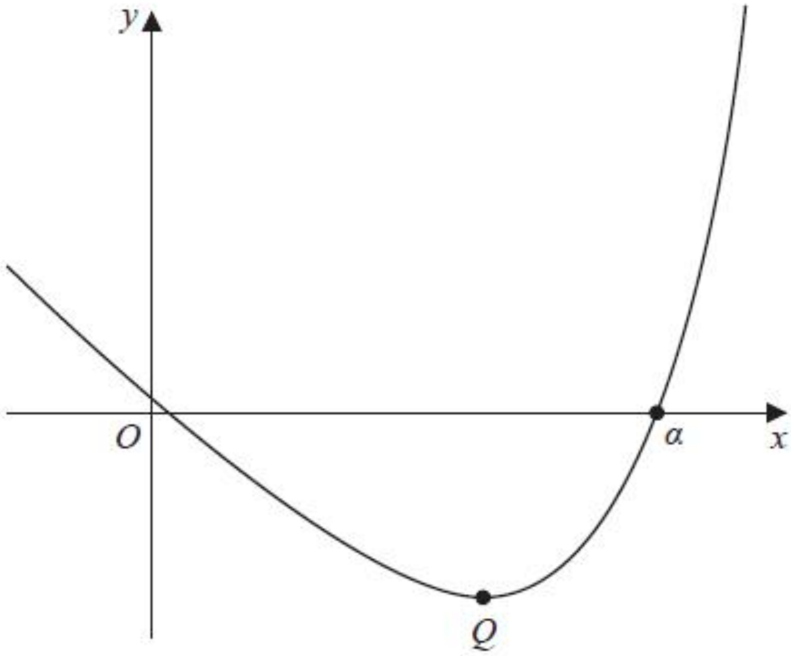

Figure 2

Figure 2 shows a sketch of the curve with equation $y = \text{f}(x)$, where

$$\text{f}(x) = 2^x - 10x$$

The curve crosses the x-axis at $x = \alpha$, $\alpha > 1$, as shown in Figure 2.

(a) Show that α lies in the interval [5, 6]

(2)

Given that $\text{f}'(x) = p \times 2^x - 10$

(b) state the value of the constant p

(1)

(c) Taking $x_0 = 6$ as a first approximation to α, apply the Newton-Raphson method once to $\text{f}(x)$ to obtain a second approximation to α

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

(2)

The curve has a minimum turning point at Q, shown in Figure 2.

(d) Use the answer to part (b) to find the x coordinate of Q

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

(2)

(Total for question = 7 marks)

(**Q04 9MA0/02/M, June 2025**)

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Q7.

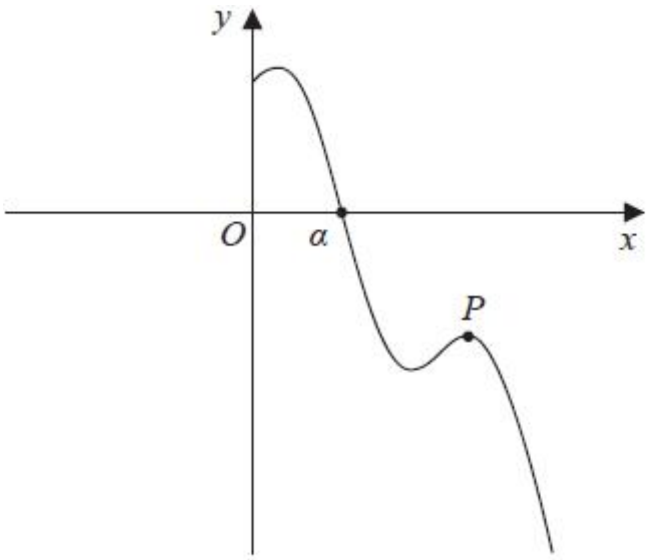

Figure 2

Figure 2 shows a sketch of part of the curve with equation $y = f(x)$ where

$$f(x) = 8\sin\left(\frac{1}{2}x\right) - 3x + 9 \qquad x > 0$$

and x is measured in radians.

The point P, shown in Figure 2, is a local maximum point on the curve.

(a) find the x coordinate of P, giving your answer to 3 significant figures.

(4)

The curve crosses the x-axis at $x = \alpha$, as shown in Figure 2.

Given that, to 3 decimal places, $f(4) = 4.274$ and $f(5) = -1.212$

(b) explain why α must lie in the interval [4, 5]

(1)

(c) Taking $x_0 = 5$ as a first approximation to α, apply the Newton-Raphson method once to $f(x)$ to obtain a second approximation to α.
Show your method and give your answer to 3 significant figures.

(2)

(Total for question = 7 marks)

(**Q06 9MA0/02, June 2022**)

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