1. $$g(x) = 3x - 5 + 5\sin\left(x^2\right)$$

where x is measured in radians.

(a) Show that $g(x) = 0$ has a root α in the interval $[0.7, 0.8]$

(2)

(b) Show that the equation $g(x) = 0$ can be written in the form

$$x = \left[\arcsin\left(1 - px\right)\right]^{\frac{1}{2}}$$

where p is a constant to be found.

(1)

Using the iteration formula

$$x_{n+1} = \left[\arcsin\left(1 - px_n\right)\right]^{\frac{1}{2}}$$

with the value of p found in part (b) and starting with $x_1 = 0.7$

(c) (i) find, to 4 decimal places, the value of x_2

(ii) find, by repeated iteration, the value of α, giving your answer to 4 decimal places.

(3)

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Question 1 continued

(Total for Question 1 is 6 marks)

2. (i) Given $y = x^2 \ln 2x$, find in simplest form, $\dfrac{dy}{dx}$

(2)

(ii) Given

$$f(x) = \frac{e^{2x}}{(4x+3)^2} \qquad x > -\frac{3}{4}$$

show that

$$f'(x) = \frac{2e^{2x}(ax+b)}{(4x+3)^3}$$

where a and b are constants to be found.

(4)

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