1.   Evaluate $I(x) = \displaystyle\int \left(\dfrac{4x^3}{x^4+1} + \left(3x^2 - x^3\right)e^{-x} + x\ln x \right)dx$ [12]

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2.   Sketch the curve whose equation in polar coordinates is $r = 1 - \sin\theta$.   [13]
      [A polar grid was supplied on the question paper]

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3.   Find the arc length between the points $(1, 2)$ and $(4, 16)$ along the curve whose   [12]
      equation in Cartesian coordinates is $y = 2x^{3/2}$.
      You may leave your answer **either** as an exact expression **or** as a decimal correct
      to two decimal places.

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4.   Find the exact value S of the sum of the series   [13+2]

$$S = \sum_{n=1}^{\infty} \frac{1}{n^2 + 7n + 12}$$

A formula sheet was also supplied with the question paper.