Core 2 Integration Questions

2 (a) Use the trapezium rule with five ordinates (four strips) to find an approximate value
    for

$$\int_0^4 \frac{1}{x^2+1}\,dx$$
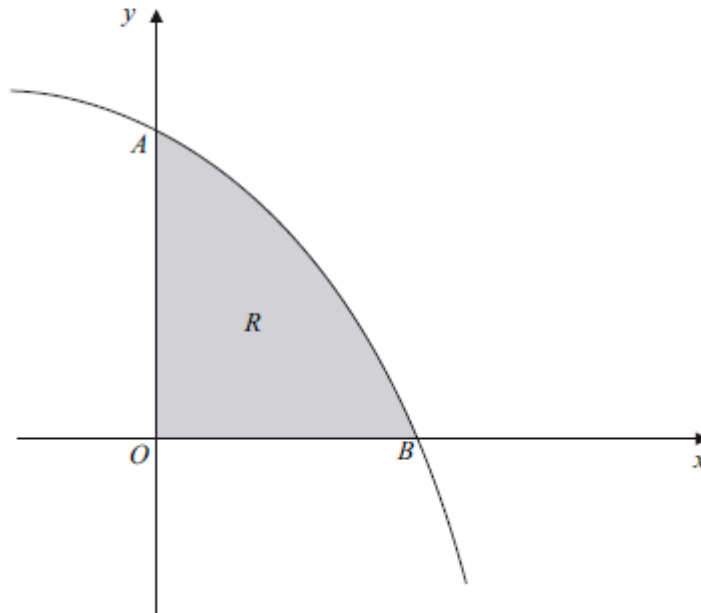
giving your answer to four significant figures.   (4 marks)

   (b) State how you could obtain a better approximation to the value of the integral using
        the trapezium rule.   (1 mark)

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6 The diagram shows a sketch of the curve with equation $y = 27 - 3^x$.

The curve $y = 27 - 3^x$ intersects the y-axis at the point A and the x-axis at the point B.

   (a) (i) Find the y-coordinate of point A.   (2 marks)

        (ii) Verify that the x-coordinate of point B is 3.   (1 mark)

   (b) The region, R, bounded by the curve $y = 27 - 3^x$ and the coordinate axes is shaded.
        Use the trapezium rule with four ordinates (three strips) to find an approximate value
        for the area of R.   (4 marks)

   (c) (i) Use logarithms to solve the equation $3^x = 13$, giving your answer to four decimal
             places.   (3 marks)

(ii) The line $y = k$ intersects the curve $y = 27 - 3^x$ at the point where $3^x = 13$. Find the value of k. *(1 mark)*

(d) (i) Describe the single geometrical transformation by which the curve with equation $y = -3^x$ can be obtained **from** the curve $y = 27 - 3^x$. *(2 marks)*
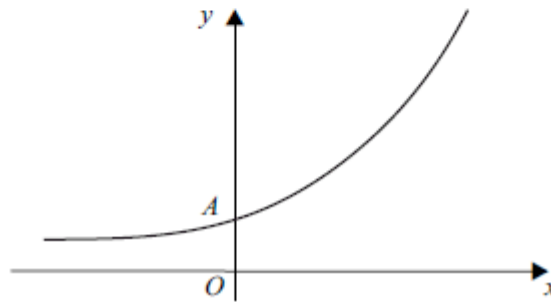
(ii) Sketch the curve $y = -3^x$. *(2 marks)*

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2 Use the trapezium rule with four ordinates (three strips) to find an approximate value for

$$\int_0^3 \sqrt{2^x}\, dx$$

giving your answer to three decimal places. *(4 marks)*

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6 The diagram shows a sketch of the curve with equation $y = 3(2^x + 1)$.

The curve $y = 3(2^x + 1)$ intersects the y-axis at the point A.

(a) Find the y-coordinate of the point A. *(2 marks)*

(b) Use the trapezium rule with four ordinates (three strips) to find an approximate value for $\int_0^6 3(2^x + 1)\, dx$. *(4 marks)*

(c) The line $y = 21$ intersects the curve $y = 3(2^x + 1)$ at the point P.

(i) Show that the x-coordinate of P satisfies the equation

$$2^x = 6$$

(1 mark)

(ii) Use logarithms to find the x-coordinate of P, giving your answer to three significant figures. *(3 marks)*