Using a substitution, prove that
$$\int \frac{1}{\sqrt{1-x^2}}\ \mathrm{d}x = \arcsin(x) + C$$

Find $\int_0^{\ln(2)} \tanh(x)\ \mathrm{d}x$.
Estimate this integral using Simpson's Rule with 4 strips and then find the percentage error in making this approximation.

Consider $I_n = \int (1-3x)^n \mathrm{e}^{3x}\ \mathrm{d}x$, show that
$I_n = \frac{1}{2}(1-3x)^n \mathrm{e}^{2x} + \frac{3n}{2} I_{n-1}$
Hence, find I_2.

Find the total area enclosed by the polar curve
$r = \cos(2\theta), \quad r > 0.$

Find the mean value of the function $f(x) = \frac{1}{\sqrt{16-x^2}}$ between $x = 2$ and $x = 2\sqrt{3}$.

Find, showing the limiting process clearly
$$I = \int_0^{\infty} \frac{10x-12}{(2x+5)(x^2+3)}\ \mathrm{d}x$$

Dr Bennison Maths
MATHEMATICS EDUCATION EXPERT

Calculate the length of the curve $y = 3x^{\frac{3}{2}}$ between $x = 0$ and $x = 2$.

Find, in exact form, the curved surface area formed by rotating the curve given by parametric equations $x = -\cos(t)$ and $y = t + \sin(t)$, 2π radians around the $x-$axes where t is between $t = 0$ and $t = \pi$.

Derive a reduction formula for $I_n = \int_0^{\pi} \cos^n(x)\ \mathrm{d}x$ and use it to evaluate I_6 in exact form.

Find the volume generated when the region enclosed by the $x-$axes, the curve $y = \sqrt{\sinh^2(x) + 2}$ and the lines $x = 0$ and $x = \ln(3)$ is rotated completely around the $x-$axis.

Given that $(x+3)$ is a factor of the numerator of the integrand, find:
$$\int_0^2 \frac{7x^3 + 18x^2 + 15x + 16}{x^4 + 4x^3 + 8x^2 + 20x + 15}\ \mathrm{d}x$$

Find, by means of a suitable substitution,
$$\int \frac{4}{x^2 + 4x + 17}\ \mathrm{d}x$$