Further Calculus – 2022 GCE Additional Pure Further Math A Y545

1. June/2022/Paper_ Y545/01/No.7

(a) Differentiate $(16+t^2)^{\frac{3}{2}}$ with respect to t. **[1]**

Let $I_n = \int_0^3 t^n \sqrt{16+t^2}\,\mathrm{d}t$ for integers $n \geqslant 1$.

(b) Show that, for $n \geqslant 3$, $(n+2)I_n = 125\times 3^{n-1} - 16(n-1)I_{n-2}$. **[5]**

(c) The curve C is defined parametrically by $x = t^4\cos t$, $y = t^4 \sin t$, for $0 \leqslant t \leqslant 3$. The length of C is denoted by L.

Show that $L = I_3$. (You are not required to evaluate this integral.) **[4]**