
$$\begin{aligned}
& \int_a^b |s_4(x)| \, dx = -\frac{1}{24} \\
& = -\frac{1}{24} \\
& + \int_{\frac{a+b}{2}}^b \left(\frac{1}{24} (x-a)^3 + \frac{1}{24} (x-a)^2 (a+b) + \frac{1}{24} (x-a) (a+b)^2 + \frac{1}{24} (a+b)^3 \right) dx \\
& = -\frac{1}{24} \\
& + ax^2(a+b) \\
& + \int_{\frac{a+b}{2}}^b \left[x^4 - 3bx^3 + 3b^2x^2 - b^3x - \frac{x^3}{3}(2a+b) + bx^2(2a+b) - b^2x(2a+b) + \frac{b^3}{3}(2a+b) \right] dx \Bigg] \\
& = -\frac{1}{24} \\
& + \frac{a^3}{3}(a+b) \\
& + \frac{bx^3}{3}(2a+b) \\
& = -\frac{1}{24} \\
& - \frac{1}{12} \left(\frac{a^3}{3}(a+b) + \frac{a^4}{2}(a+b) + \frac{b^5}{5} - \frac{1}{5} \left(\frac{a^3}{3}(a+b) + \frac{a^4}{2}(a+b) + \frac{b^5}{5} \right) \right. \\
& \left. + \frac{1}{12} \left(\frac{a^3}{3}(a+b) + \frac{a^4}{2}(a+b) + \frac{b^5}{5} \right) \right) \\
& = -\frac{1}{24} \\
& + \frac{4}{3}(a^2 + b^2)
\end{aligned}$$