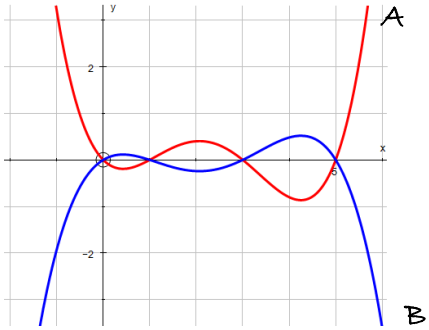
Section 2: Area under a curve

Solutions to Exercise level 3 (Extension)

1. (i)



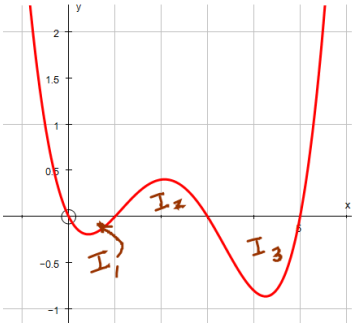
(ii) $\int_a^b \left(x^4 - 9x^3 + 23x^2 - 15\right)dx = \left[\frac{1}{5}x^5 - \frac{9}{4}x^4 + \frac{23}{3}x^3 - \frac{15}{2}x^2\right]_a^b$

$I_1 = \left[\frac{1}{5}x^5 - \frac{9}{4}x^4 + \frac{23}{3}x^3 - \frac{15}{2}x^2\right]_0^1 = -\frac{113}{60}$

$I_2 = \left[\frac{1}{5}x^5 - \frac{9}{4}x^4 + \frac{23}{3}x^3 - \frac{15}{2}x^2\right]_1^3 = \frac{117}{20} + \frac{113}{60} = \frac{116}{15}$

$I_3 = \left[\frac{1}{5}x^5 - \frac{9}{4}x^4 + \frac{23}{3}x^3 - \frac{15}{2}x^2\right]_3^5 = -\frac{125}{12} - \frac{117}{20} = -\frac{244}{15}$

Total area $= \frac{1553}{60}$



(iii) Total area of petals design $= \left(\frac{1}{15} + \frac{1}{25}\right) \times \frac{1553}{60}$

$= 2.761 \text{ m}^3$ (4 s.f.)