

STEP III, 2000 Q2

- 2 Use the substitution $x = 2 - \cos \theta$ to evaluate the integral

$$\int_{3/2}^2 \left(\frac{x-1}{3-x} \right)^{\frac{1}{2}} dx.$$

Show that, for $a < b$,

$$\int_p^q \left(\frac{x-a}{b-x} \right)^{\frac{1}{2}} dx = \frac{(b-a)(\pi + 3\sqrt{3-6})}{12},$$

where $p = (3a+b)/4$ and $q = (a+b)/2$.



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