

STEP III, 2011 Q6

- 6 The definite integrals T , U , V and X are defined by

$$T = \int_{\frac{1}{3}}^{\frac{1}{2}} \frac{\operatorname{artanh} t}{t} dt,$$

$$U = \int_{\ln 2}^{\ln 3} \frac{u}{2 \sinh u} du,$$

$$V = - \int_{\frac{1}{3}}^{\frac{1}{2}} \frac{\ln v}{1 - v^2} dv,$$

$$X = \int_{\frac{1}{2} \ln 2}^{\frac{1}{2} \ln 3} \ln(\coth x) dx.$$

Show, without evaluating any of them, that T , U , V and X are all equal.



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