

STEP II, 2016, Q7

7 Show that

$$\int_0^a f(x)dx = \int_0^a f(a-x)dx, \quad (*)$$

where f is any function for which the integrals exist.

(i) Use (*) to evaluate

$$\int_0^{\frac{1}{2}\pi} \frac{\sin x}{\cos x + \sin x} dx.$$

(ii) Evaluate

$$\int_0^{\frac{1}{4}\pi} \frac{\sin x}{\cos x + \sin x} dx.$$

(iii) Evaluate

$$\int_0^{\frac{1}{4}\pi} \ln(1 + \tan x) dx.$$

(iv) Evaluate

$$\int_0^{\frac{1}{4}\pi} \frac{x}{\cos x (\cos x + \sin x)} dx.$$



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