14. (a) Use the substitution $u = 1 + \sin^2 x$ to show that

$$\int_0^{\frac{\pi}{6}} \frac{8\tan x}{1+\sin^2 x}\,\mathrm{d}x = \int_p^q \frac{4}{u(2-u)}\,\mathrm{d}u$$

where p and q are constants to be found.

(5)

(b) Hence, using algebraic integration, show that

$$\int_0^{\frac{\pi}{6}} \frac{8\tan x}{1+\sin^2 x}\,\mathrm{d}x = \ln A$$

where A is a rational number to be found.

(6)