11. (i) Given that

$$y = a^x$$

where a is a positive constant, show that

$$\frac{\mathrm{d}y}{\mathrm{d}x} = a^x \ln a$$

(2)

(ii) Given that

$$x = 2\tan y \qquad -\frac{\pi}{2} < y < \frac{\pi}{2}$$

show that

$$\frac{\mathrm{d}y}{\mathrm{d}x} = \frac{k}{4 + x^2}$$

where k is a constant to be found.

(4)