Dr Oliver Mathematics
Rates of Change: Part 1

1. The area in square units of an expanding circle is increasing twice as fast as its radius in linear units.

   Calculate the radius.

   Solution

   Well,
   $$A = \pi r^2 \Rightarrow \frac{\mathrm{d}A}{\mathrm{d}r} = 2\pi r.$$

   Finally,
   $$\frac{\mathrm{d}A}{\mathrm{d}t} = \frac{\mathrm{d}A}{\mathrm{d}r} \cdot \frac{\mathrm{d}r}{\mathrm{d}t} \Rightarrow 2\frac{\mathrm{d}r}{\mathrm{d}t} = 2\pi r\frac{\mathrm{d}r}{\mathrm{d}t}$$
   $$\Rightarrow \pi r = 1$$
   $$\Rightarrow r = \frac{1}{\pi}.$$