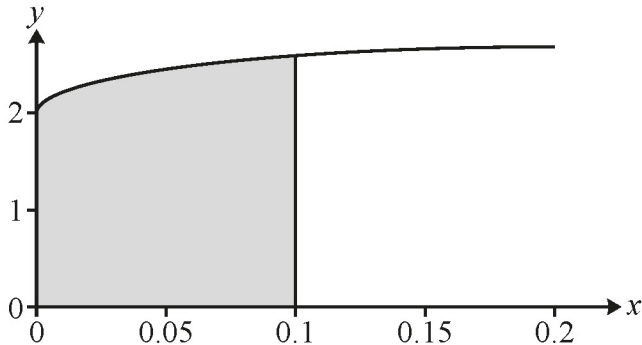**8** The equation of a curve is $y = \sqrt{\sin 4x} + 2\cos 2x$, where x is in radians.

(a) Show that, for small values of x, $y \approx 2\sqrt{x} + 2 - 4x^2$. **[2]**

The diagram shows the region bounded by the curve $y = \sqrt{\sin 4x} + 2\cos 2x$, the axes and the line $x = 0.1$.

(b) **In this question you must show detailed reasoning.**

Use the approximation in part **(a)** to estimate the area of this region. **[4]**