1


The diagram shows part of the curve with parametric equations

$$
x=2 t-4, \quad y=\frac{1}{t} .
$$

The shaded region is bounded by the curve, the coordinate axes and the line $x=2$.
a Find the value of the parameter $t$ when $x=0$ and when $x=2$.
b Show that the area of the shaded region is given by $\int_{2}^{3} \frac{2}{t} \mathrm{~d} t$.
c Hence, find the area of the shaded region.
d Verify your answer to part $\mathbf{c}$ by first finding a cartesian equation for the curve.
2


The diagram shows the ellipse with parametric equations

$$
x=4 \cos \theta, \quad y=2 \sin \theta, \quad 0 \leq \theta<2 \pi
$$

which meets the positive coordinate axes at the points $A$ and $B$.
a Find the value of the parameter $\theta$ at the points $A$ and $B$.
b Show that the area of the shaded region bounded by the curve and the positive coordinate axes is given by

$$
\int_{0}^{\frac{\pi}{2}} 8 \sin ^{2} \theta \mathrm{~d} \theta
$$

c Hence, show that the area of the region enclosed by the ellipse is $8 \pi$.
3


The diagram shows the curve with parametric equations

$$
x=2 \sin t, \quad y=5 \sin 2 t, \quad 0 \leq t<\pi
$$

a Show that the area of the region enclosed by the curve is given by $\int_{0}^{\frac{\pi}{2}} 20 \sin 2 t \cos t \mathrm{~d} t$.
b Evaluate this integral.

