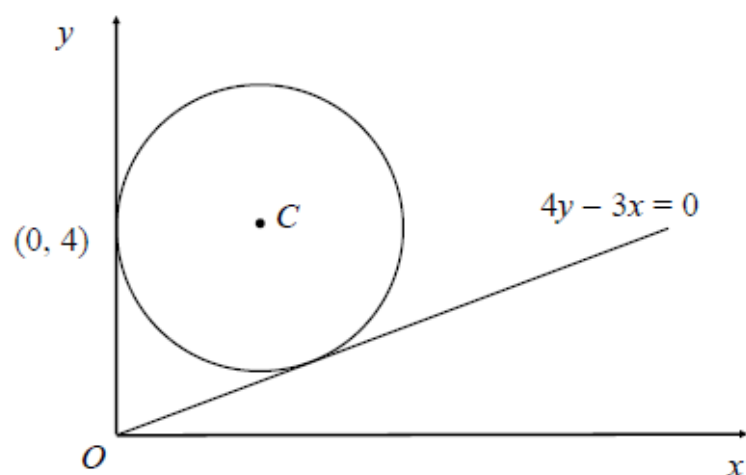**4.**

Figure 1

The circle, with centre C and radius r, touches the y-axis at $(0, 4)$ and also touches the line with equation $4y - 3x = 0$, as shown in Fig. 1.

(*a*) (i) Find the value of r.

(ii) Show that $\quad \arctan\left(\frac{3}{4}\right) + 2 \arctan\left(\frac{1}{2}\right) = \frac{1}{2}\pi$.

(8)

The line with equation $4x + 3y = q$, $q > 12$, is a tangent to the circle.

(*b*) Find the value of q.

(4)