

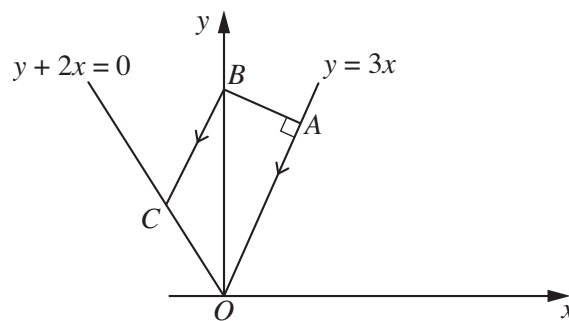
1 Given that  $\sqrt{a+b\sqrt{3}} = \frac{13}{4+\sqrt{3}}$ , where  $a$  and  $b$  are integers, find, without using a calculator, the value of  $a$  and of  $b$ . [4]

2 Solve the equation  $\log_{16}(3x-1) = \log_4(3x) + \log_4(0.5)$ . [6]

3 Given that  $6x^3 + 5ax - 12a$  leaves a remainder of  $-4$  when divided by  $x - a$ , find the possible values of  $a$ . [7]

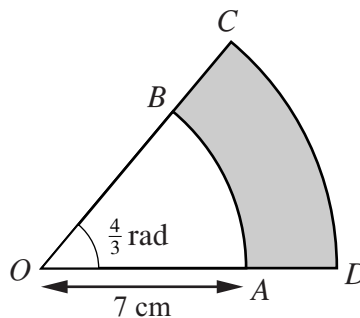
4 Find the values of  $k$  for which the line  $y = x + 2$  meets the curve  $y^2 + (x + k)^2 = 2$ . [5]

5



The diagram shows a trapezium  $OABC$ , where  $O$  is the origin. The equation of  $OA$  is  $y = 3x$  and the equation of  $OC$  is  $y + 2x = 0$ . The line through  $A$  perpendicular to  $OA$  meets the  $y$ -axis at  $B$  and  $BC$  is parallel to  $AO$ . Given that the length of  $OA$  is  $\sqrt{250}$  units, calculate the coordinates of  $A$ , of  $B$  and of  $C$ . [10]

6



The diagram shows a sector  $COD$  of a circle, centre  $O$ , in which angle  $COD = \frac{4}{3}$  radians. The points  $A$  and  $B$  lie on  $OD$  and  $OC$  respectively, and  $AB$  is an arc of a circle, centre  $O$ , of radius  $7$  cm. Given that the area of the shaded region  $ABCD$  is  $48 \text{ cm}^2$ , find the perimeter of this shaded region. [6]