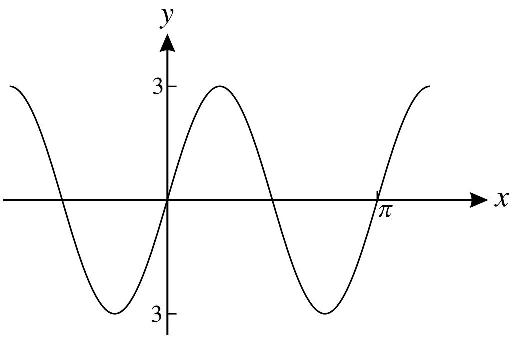
1 Solve each of the following equations, giving your answers in exact form.

(i) $6 \arcsin x - \pi = 0$. **[2]**

(ii) $\arcsin x = \arccos x$. **[2]**

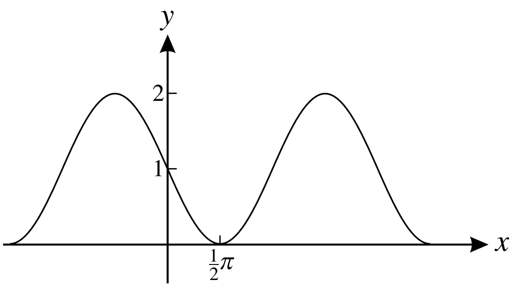
2 The curves in parts **(i)** and **(ii)** have equations of the form $y = a + b \sin cx$, where a, b and c are constants. For each curve, find the values of a, b and c.

(i)



[2]

(ii)



[2]

3 Given that $\arcsin x = \arccos y$, prove that $x^2 + y^2 = 1$. [Hint: let $\arcsin x = \theta$.] **[3]**

4 **(i)** State the period of the function $f(x) = 1 + \cos 2x$, where x is in degrees. **[1]**

(ii) State a sequence of two geometrical transformations which maps the curve $y = \cos x$ onto the curve $y = f(x)$. **[4]**

(iii) Sketch the graph of $y = f(x)$ for $-180° < x < 180°$. **[3]**

5 Fig. 7 shows the curve $y = f(x)$, where $f(x) = 1 + 2\arctan x$, $x \in \mathbb{R}$. The scales on the x- and y-axes are the same.

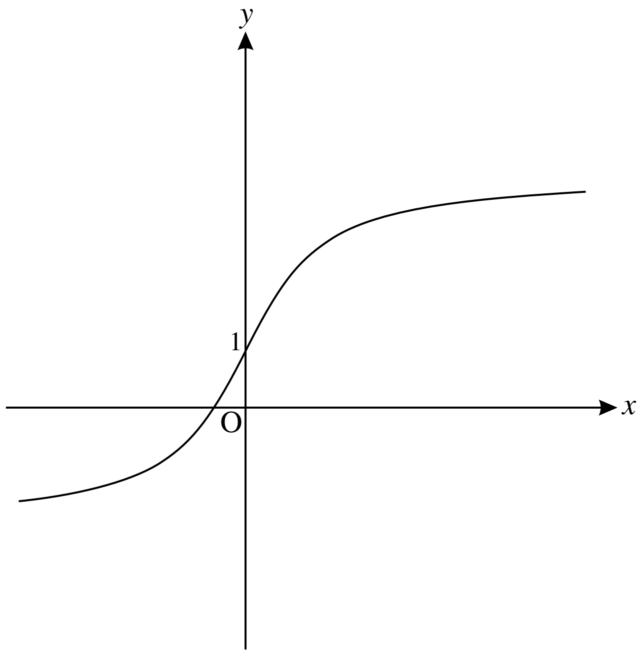


Fig. 7

(i) Find the range of f, giving your answer in terms of π. **[3]**

(ii) Find $f^{-1}(x)$, and add a sketch of the curve $y = f^{-1}(x)$ to the copy of Fig. 7. **[5]**

6 Fig. 8 shows part of the curve $y = x\cos 3x$.

The curve crosses the x-axis at O, P and Q.

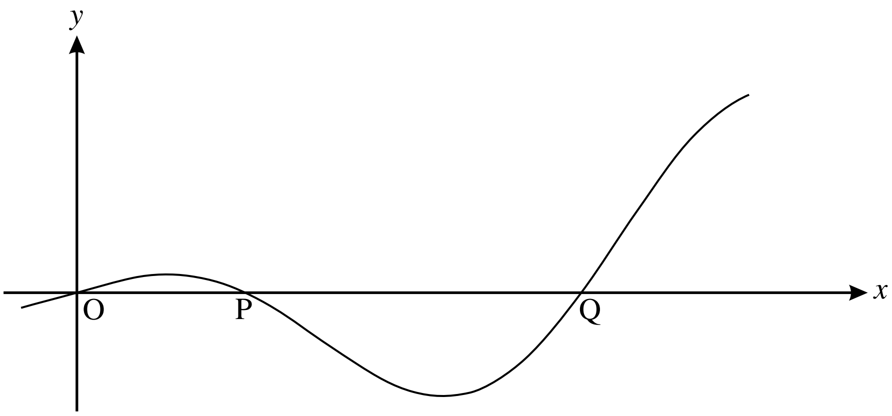


Fig. 8

(i) Find the exact coordinates of P and Q. **[4]**

(ii) Find the exact gradient of the curve at the point P.

Show also that the turning points of the curve occur when $x\tan 3x = \frac{1}{3}$. **[7]**

(iii) Find the area of the region enclosed by the curve and the x-axis between O and P, giving your answer in exact form. **[6]**

7 Sketch the curve $y = 2\arccos x$ for $-1 \leqslant x \leqslant 1$. **[3]**

8 Fig. 6 shows the curve $y = \mathrm{f}(x)$, where $\mathrm{f}(x) = \frac{1}{2}\arctan x$.

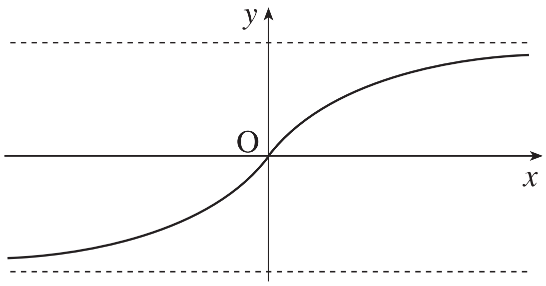


Fig. 6

(i) Find the range of the function $\mathrm{f}(x)$, giving your answer in terms of π. [2]

(ii) Find the inverse function $\mathrm{f}^{-1}(x)$. Find the gradient of the curve $y = \mathrm{f}^{-1}(x)$ at the origin. [5]

(iii) Hence write down the gradient of $y = \frac{1}{2}\arctan x$ at the origin. [1]

9 Given that $\arcsin x = \frac{1}{6}\pi$, find x. Find $\arccos x$ in terms of π. [3]