**9.**

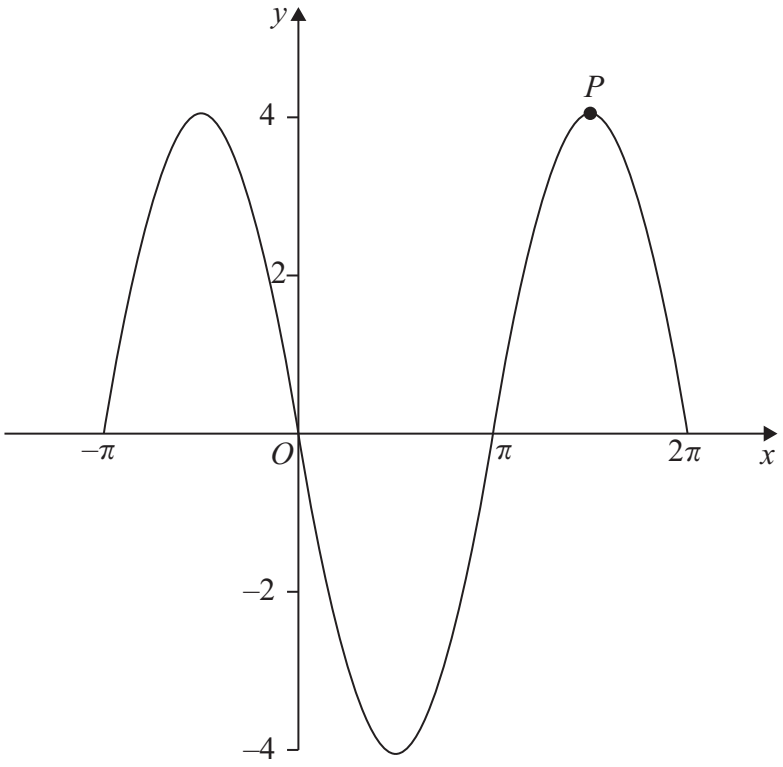


**Figure 3**

Figure 3 shows a sketch of part of the graph of the trigonometric function with equation $y = \mathrm{f}(x)$

(a) Write down an expression for $\mathrm{f}(x)$

**(2)**

The point $P$ lies on $y = \mathrm{f}(x)$ and is shown in Figure 3.

(b) State the coordinates of the point to which $P$ is transformed when the graph of $y = \mathrm{f}(x)$ is transformed to the graph with equation

(i) $y = \mathrm{f}\left(x - \frac{\pi}{6}\right)$

**(2)**

(ii) $y = -\frac{1}{2}\mathrm{f}(x)$

**(2)**

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**Question 9 continued**

**(Total for Question 9 is 6 marks)**

**10.**

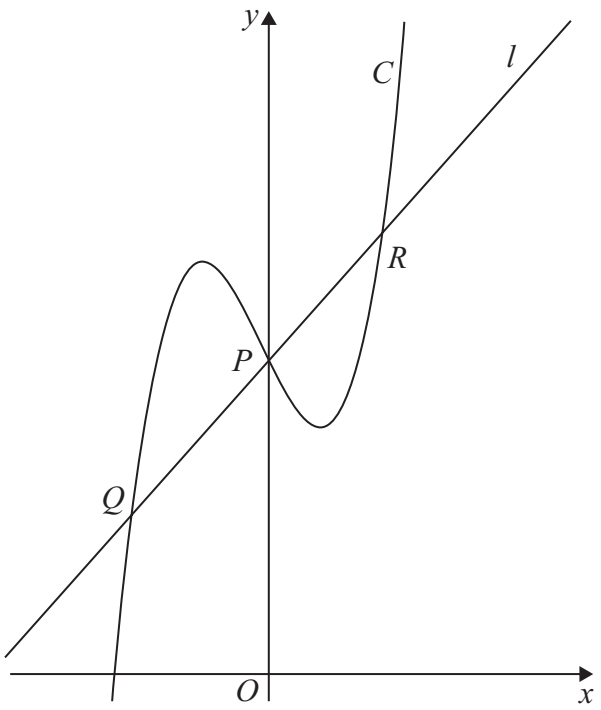


**Figure 4**

**In this question you must show all stages of your working.**
**Solutions relying entirely on calculator technology are not acceptable.**

Figure 4 shows a sketch of the curve $C$ with equation

$$y = 2x^3 + \frac{1}{2}x^2 - 2x + 5$$

The line $l$ is the normal to $C$ at the point $P$ where $x = 0$

The line $l$ also intersects $C$ at points $Q$ and $R$ as shown in Figure 4.

(a) Find, using algebra, the $x$ coordinate of point $Q$.

**(6)**

The point $T$ lies on $C$.

Given that

- the tangent to $C$ at $T$ is parallel to $l$
- the $x$ coordinate of $T$ is positive

(b) find, using algebra, the exact $x$ coordinate of $T$.

**(4)**

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