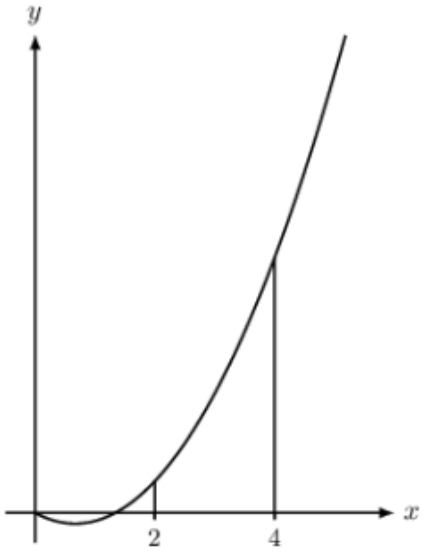
# Areas

## 1.

NO CALCULATOR Easy

[Maximum mark: 6]

Let $f(x) = 3x^2 - 4x$. The graph of $f$ is shown in the following diagram.




(a) Find $\int (3x^2 - 4x)\,dx$. [2]

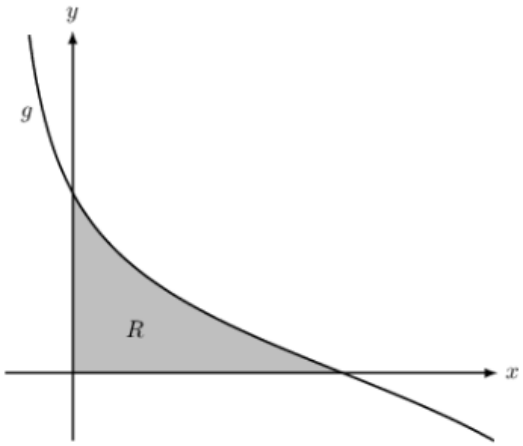
(b) Find the area of the region enclosed by the graph of $f$, the $x$-axis and the lines $x = 2$ and $x = 4$. [4]

## 2.

NO CALCULATOR Hard ●●●●○

[Maximum mark: 8]

Let $g(x) = \dfrac{8-2x}{\sqrt{9+8x-x^2}}$. The following diagram shows part of the graph of $g$.



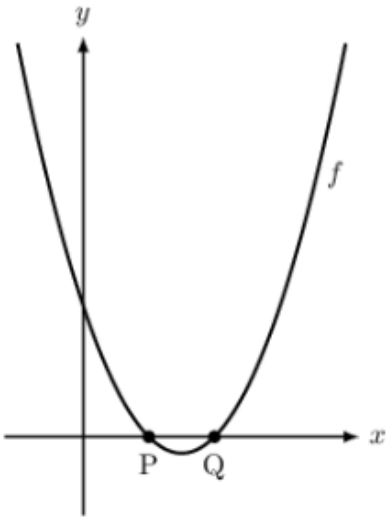

The region $R$ is enclosed by the graph of $g$, the $x$-axis, and the $y$-axis. Find the area of $R$.

## 3.

NO CALCULATOR Medium

[Maximum mark: 16]

Let $f(x) = x^2 - 3x + 2$, for $x \in \mathbb{R}$. The following diagram shows part of the graph of $f$.



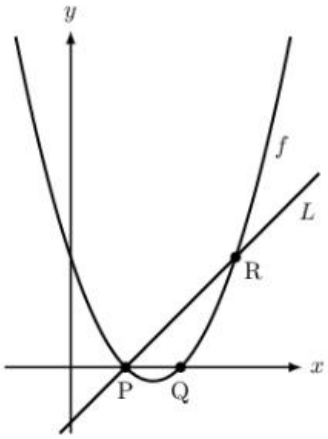

The graph of $f$ crosses the $x$-axis at the point $P(1, 0)$ and at the point $Q(2, 0)$.

(a) Show that $f'(1) = -1$. [3]

The line $L$ is the normal to the graph of $f$ at P.

(b) Find the equation of $L$ in the form $y = mx + c$. [3]

The line $L$ intersects the graph of $f$ at another point R, as shown in the following diagram.




(c) Find the $x$-coordinate of R. [4]

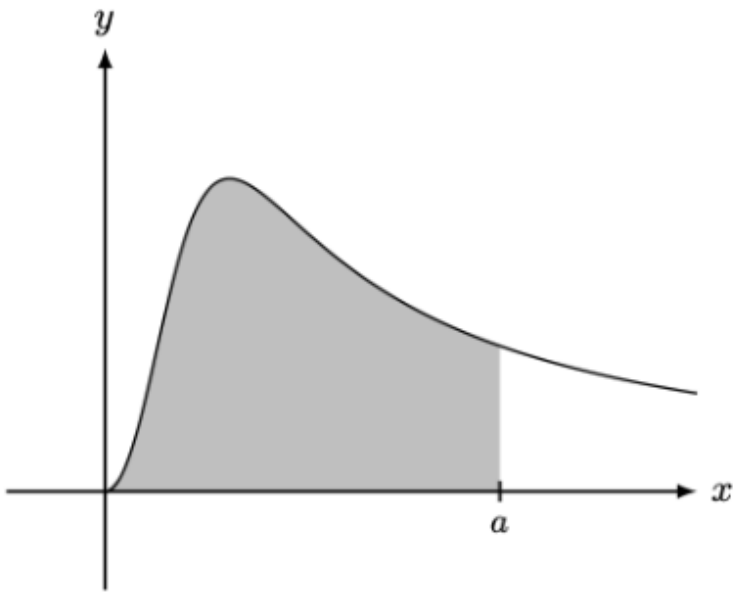
(d) Find the area of the region enclosed by the graph of $f$ and the line $L$. [6]

**4.**

NO CALCULATOR Hard ●●●●○

[Maximum mark: 6]

The following diagram shows part of the graph of $y = \frac{6x^2}{1+x^3}$ for $x \geq 0$.




The area bounded by the curve, the $x$-axis and the line $x = a$, shaded in grey, equals $2\ln(65)$.

Find the value of $a$.