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A LEVEL MATHS

# (67) Integration to Find Areas

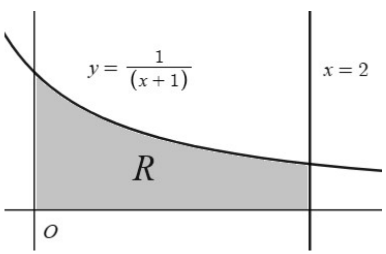
## WORKING AT D/E

(1) (a) Sketch the graph of $y = \cos(x)$ for $0 \leq x \leq 2\pi$.

(b) Write down the coordinates of the points $A$ and $B$ where the graph crosses the $x$ axis.

(c) Use integration to show that the area trapped between the curve and the $x$ axis between the points $A$ and $B$ is 2 units

(2) The diagram below shows part of the curve with equation $y = \frac{1}{x+1}$ and the line with the equation $x = 2$.

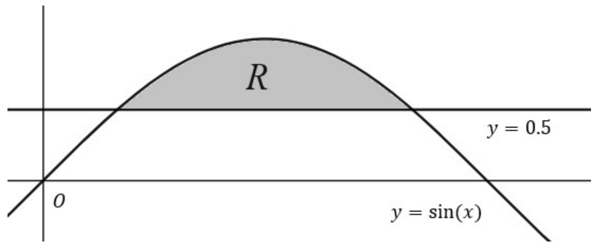



The region $R$ is the shaded region enclosed the curve, the line and the positive $x$ and $y$ axis.

Show that the area of $R$ is $\ln A$ where $A$ is an integer to be found.

## WORKING AT B/C

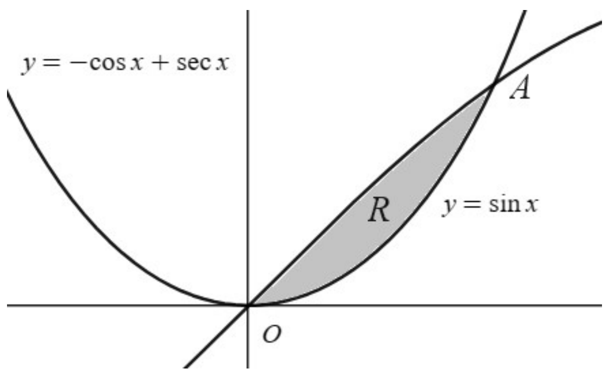
(1) The diagram below shows part of the curve with equation $y = \sin(x)$ and part of the line with equation $y = 0.5$




The shaded region $R$ is the area enclosed between the line and the curve.

Show that the area of $R$ is $\sqrt{3} - \frac{\pi}{3}$

(2) The diagram below shows part of the graphs of $y = -\cos x + \sec x$ and $y = \sin x$.




The graphs intersect at the point $A$

(a) Find the coordinates of $A$

(b) Using the formula book, find the area of the region $R$. Give your answer in exact form.

## WORKING AT A*/A

(1) (a) On the same set of axes sketch the graphs of $y = \cos(2x)$ and $y = -\sin(x)$ for $-\pi \leq x \leq \pi$

(b) The graphs of $y = \cos(2x)$ and $y = -\sin(x)$ intersect at the point $A$ and $B$ in the interval $-\pi \leq x \leq \pi$. Find the $x$ coordinates of the $A$ and $B$ giving your answers in exact form.

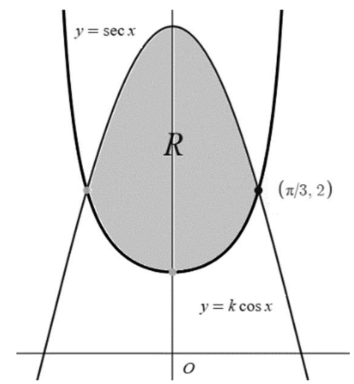
(c) Show that the area trapped between the two curves between $A$ and $B$ can be written in the form $p\sqrt{3} + q$ where $p$ and $q$ are rational fractions.

(2) The curve $C$ has parametric equations:

$$x = e^{t+1}, \qquad y = t^2 - 4, \qquad t \in R$$

The curve crosses the $x$ axis at $A$ and $B$. Find the exact area trapped between the curve and the positive $x$ axis between $A$ and $B$.

(3) The diagram below shows part of the curves with equations $y = k\cos(x)$ and $y = \sec(x)$.




Given that the curves intersect at the point with coordinates $\left(\frac{\pi}{3}, 2\right)$, show that exact area of the region $R$ is $4\sqrt{3} - \ln\left(2 + \sqrt{3}\right)^2$