**Formulae**

You are given

\[
\begin{align*}
\cos^3 t &= \frac{3}{4} \cos t + \frac{1}{4} \cos 3t \\
\sin t \cos^2 t &= \frac{1}{4} \sin t + \frac{1}{4} \sin 3t \\
\sin^2 t \cos t &= \frac{1}{4} \cos t - \frac{1}{4} \cos 3t \\
\sin^3 t &= \frac{3}{4} \sin t - \frac{1}{4} \sin 3t \\
2 \cos A \cos B &= \cos(A - B) + \cos(A + B) \\
2 \cos A \sin B &= \sin(A + B) + \sin(B - A) \\
2 \sin A \sin B &= \cos(A - B) - \cos(A + B)
\end{align*}
\]

The **Divergence Theorem** or **Gauss’ Theorem** in the plane states the following: If \( C \) is a closed path that is the boundary of a region \( D \) of the plane and \((u, v)\) is a vector field that is continuously differentiable on a neighbourhood of \( \bar{D} \) then

\[
\iint_D \left( \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} \right) \, dx \, dy = \oint_C u \, dy - v \, dx
\]