CfE AH Maths Homework (9)

① Write down and simplify the general term in the expansion of $\left(2x - \frac{1}{x^2}\right)^9$

Hence or otherwise obtain the term independent of x. [2012]

② Write down and simplify the general term in the expansion of $\left(x^2 + \frac{1}{x}\right)^{10}$

Hence or otherwise obtain the term in x^{14} [2008]

③ (a) Differentiate $f(x) = \cos^{-1}(3x)$ where $-\frac{1}{3} < x < \frac{1}{3}$

(b) Given $x = 2\sec\theta$, $y = 3\sin\theta$ use parametric differentiation to find $\frac{dy}{dx}$ in terms of θ [2008]

④ Use integration by parts to obtain $\int 8x^2 \sin 4x \, dx$ [2008]

⑤ Express $\frac{12x^2+20}{x(x^2+5)}$ in partial fractions.

Hence evaluate $\int_1^2 \frac{12x^2+20}{x(x^2+5)} \, dx$ [2008]

⑥ Write down the derivative of $\tan x$

Show that $1 + \tan^2 x = \sec^2 x$

Hence obtain $\int \tan^2 x \, dx$ [2008]

⑦ A curve defined by the equation $xy^2 + 3x^2y = 4$ for $x > 0$ and $y > 0$.

Use implicit differentiation to find $\frac{dy}{dx}$.

Hence find an equation of the tangent to the curve where $x = 1$ [2008]