# CfE AH Maths Homework 8

① Obtain the binomial expansion for $(a^2-3)^4$

[2004]

② Express the binomial expansion of $\left(x-\frac{2}{x}\right)^4$ in the form $ax^4+bx^2+c+\frac{d}{x^2}+\frac{e}{x^4}$ for integers $a, b, c, d, e$.

[2007]

③ Show that

$$\binom{n+1}{3}-\binom{n}{3}=\binom{n}{2}$$

where the integer $n$ is greater than or equal to 3

[2010]

④ Use the substitution $x=(u-1)^2$ to obtain

$$\int \frac{1}{(1+\sqrt{x})^3}\,dx$$

⑤ Solve the differential equation

$$\frac{d^2y}{dx^2}-4\frac{dy}{dx}+4y=e^x$$

given that $y=2$ and $\frac{dy}{dx}=1$ when $x=0$ [2003

⑥ Given $y=t^3-\frac{5}{2}t^2$ and $x=\sqrt{t}$, $t>0$, use parametric differentiation to express $\frac{dy}{dx}$ in terms of $t$ in simplified form.

Show $\frac{d^2y}{dx^2}=at^2+bt$, determining the values of the constants $a$ and $b$.

Obtain an equation for the tangent to the curve which passes through the point when $t=1$.

[2010]