CfE AH Maths Homework 4

1. Express $\dfrac{4(r+1)}{r^2(r+2)^2}$ in partial fractions.

2. Evaluate $\displaystyle\int_0^4 \frac{x+2}{x+1}\,dx$

3. Use the substitution $u = 1+\sin x$ to evaluate the definite integral $\displaystyle\int_0^{\frac{\pi}{2}} \frac{\cos x}{(1+\sin x)}\,dx$

4. Find the value of $\displaystyle\int_0^{\frac{\pi}{4}} 2x\sin 4x\,dx$

5. Using partial fractions prove

$$\frac{1}{1-4x^2} = \frac{1}{2}\left[\frac{1}{2x+1} - \frac{1}{2x-1}\right]$$

Hence find the exact value of the integral

$$\int_{-\frac{1}{4}}^{\frac{1}{4}} \frac{1}{1-4x^2}\,dx$$

6. Obtain the exact value of $\displaystyle\int_0^2 x^2 e^{4x}\,dx$

7. (a) Use integration by parts to obtain an expression for $\displaystyle\int e^x \cos x\,dx$

(b) Similarly given $I_n = \displaystyle\int e^x \cos nx\,dx$ where $n \neq 0$ obtain an expression for I_n

(c) Hence evaluate $\displaystyle\int_0^{\frac{\pi}{2}} e^x \cos 8x\,dx$.