AH Differentiation Homework (2)

1.   (a) Write down the definitions of $\sec x, \quad cosec\, x \quad and \quad \cot x$. **(1)**

    (b) Use either the chain rule or quotient rule to differentiate $\sec x, \quad cosec\, x \quad and \cot x$.

    (3)

    (c) Hence find the derivatives of :-

        (i) $\cot 3x$ (ii) $cosec^2 x$ (iii) $2x^2 \sec x$ **(3)**

2.   Differentiate the following functions with respect to x, simplifying your answers where possible.

    (a) $h(x) = -\ln(\cos 5x)$ **(3)**

    (b) $y = \dfrac{\ln(x+3)}{x+3}, \quad x > -3$ **(3)**

3.   Differentiate with respect to x

    (a) $y = x^2 \tan^{-1}\left(\sqrt{x-1}\right)$ **(4)**

    (b) $y = \tan^{-1} e^{3x}$ **(3)**

    (c) $y = \sin^{-1}(x^4)$ **(3)**

4.   Differentiate with respect to x

    (a) $y = 4\tan^2 3x$ **(3)**

    (b) $y = e^{\cot 2x} , \quad 0 < x < \dfrac{\pi}{2}$ **(3)**

5.   (a)   Given $f(x) = \cos^2 x \, e^{\tan x} , \quad -\dfrac{\pi}{2} < x < \dfrac{\pi}{2}$, obtain $f'(x)$ and evaluate $f'\left(\dfrac{\pi}{4}\right)$ **(5)**

    (b)   Differentiate $g(x) = \dfrac{\tan^{-1} 2x}{1+4x^2}$ with respect to x.   **(3)**

6.   Given $f(x) = \ln(\cos^{-1} 2x)$, find $f'(x)$.   **(3)**

Total = 40 marks