National Junior College
2016 – 2017 H2 Mathematics
Integration Techniques

Equations and Inequalities **Assignment**

Name: _____

Time

Class: 1ma2___ / 1IPma21____ / 1IPma22____

Subject Tutor: _____

Suggested Duration: 55min

You are advised to complete this ungraded piece of assignment in one sitting, and to use only MF26. This will allow you to diagnose the weak sub-topic(s) to focus on in your subsequent revision.

1 Find **(a)** $\int \frac{\ln(1+2x)}{1+2x}\,\mathrm{d}x$, **(b)** $\int \sec^2 x \ln|\cos x|\,\mathrm{d}x$. [5]

2 **(a)** By using the substitution $x = \frac{1}{u}$, find $\int \frac{1}{x\sqrt{x^2-4}}\,\mathrm{d}x$. [4]

(b) By using the substitution $x = 5\cos\theta$, find $\int \frac{\sqrt{25-x^2}}{x}\,\mathrm{d}x$. [6]

3 **(a)** Write down the constants A and B such that, for all values of x,

$$2x+5 = A(x-1)+B.$$

Hence find $\int \frac{2x+5}{x^2-2x+5}\,\mathrm{d}x$. [5]

(b) By considering the derivative of $\tan\left(x^2\right)$, find $\int x^3 \sec^2\left(x^2\right)\,\mathrm{d}x$. [5]

4 **(i)** Show that

$$\frac{\mathrm{d}}{\mathrm{d}x}\left(\frac{1}{\sqrt{x^2-1}}\right) = -\frac{x}{\left(x^2-1\right)^{\frac{3}{2}}}.$$ [1]

(ii) By using the substitution $x = \frac{1}{y}$, find $\int \frac{1}{x\sqrt{x^2-1}}\,\mathrm{d}x$. [3]

(iii) Find $\int x\left(x^2-1\right)^{-\frac{3}{2}} \ln x\,\mathrm{d}x$. [3]