Hyperbolics Test – Chapter 6 – CP2 – www.m4ths.com – Steve Blades

(1) Solve the equation $2\sinh^2 x - 5\cosh x = 1$ giving your answers in exact form.

(2) (a) Find the first 3 non-zero terms in the Maclaurin Expansion of $\sinh 2x$

(b) Find the percentage error for $\sinh 0.8$ when using the approximation found in part (a)

(3) Given that $2\operatorname{artanh}(p) = \ln q$, express, p in terms of q

(4) Given that $\sinh A = \frac{2}{5}$, find the exact value $\sinh 2A$

(5) Show that

$$\int_{\ln 4}^{\ln 8} e^x \cosh x \, dx = 12 + \ln\sqrt{2}$$

(6) Show that there is only one stationary point on the curve with equation $y = \cosh x - 3\cosh 2x$ giving the coordinates of the stationary point.

(7) Using exponentials, show that:
$$\cosh 2A \equiv 2\cosh^2 A - 1$$

(8) Solve the equation $\sinh x + \cosh x = 7$ giving your answer in exact form.

(9) Prove that $\operatorname{artanh} x = \frac{1}{2}\ln\left(\frac{1+x}{1-x}\right), |x| < 1$

(10) Use a substitution to find
$$\int \frac{1}{\sqrt{x^2 - 2x + 10}} \, dx$$

(11) Show that:
$$\int \sinh^3 x \, dx = \frac{1}{3}\cosh x \, (\cosh^2 x - 3) + c$$

(12) Given that $y = \operatorname{arcosh} x$, show that:
$$(x^2 - 1)\frac{d^2 y}{dx^2} + x\frac{dy}{dx} = 0$$

(13) Show that
$$\int_0^4 \frac{2x + 1}{\sqrt{x^2 + 16}} \, dx = 8(\sqrt{2} - 1) + \ln(1 + \sqrt{2})$$

(14) (a) Express $10\cosh x + 6\sinh x$ in the form $R\cosh(x + \alpha)$ giving α to 3SF.

(b) $g(x) = \frac{1}{10\cosh x + 6\sinh x}$, $x\varepsilon R$. Using your answer to part (a), find the maximum value of $g(x)$.