Section 2: The inverse hyperbolic functions

Exercise level 1

1. Find the exact values of
   (i) $\operatorname{arsinh} 3$ (ii) $\operatorname{arcosh} \frac{5}{3}$ (iii) $\operatorname{artanh} \frac{5}{8}$ (iv) $\operatorname{arsinh}(-2)$

2. (i) Prove that $\frac{\mathrm{d}}{\mathrm{d}x}(\operatorname{arcosh} x) = \frac{1}{\sqrt{x^2-1}}$
   (ii) Differentiate $\operatorname{arcosh}(2x+1)$.
   (iii) Differentiate $\mathrm{e}^{4x}\operatorname{arcosh}(2x+1)$.

3. Find
   (i) $\int \frac{1}{\sqrt{x^2+9}}\,\mathrm{d}x$ (ii) $\int \frac{1}{\sqrt{x^2-9}}\,\mathrm{d}x$ (iii) $\int \frac{1}{\sqrt{9x^2+1}}\,\mathrm{d}x$ (iv) $\int \frac{1}{\sqrt{9x^2-1}}\,\mathrm{d}x$

4. Find, giving your answers to 3 s.f.,
   (i) $\int_0^1 \frac{1}{\sqrt{x^2+4}}\,\mathrm{d}x$ (ii) $\int_{0.5}^1 \frac{1}{\sqrt{16x^2-1}}\,\mathrm{d}x$ (iii) $\int_1^2 \frac{1}{\sqrt{4x^2+3}}\,\mathrm{d}x$