

Problem Sheet 4 for 6401

Due Thursday 3 Nov 2011, at the Problem Class. You should hand in solutions to all problems, but only some of them will be marked. The deadline for handing in your work is 11.55am.

1. Prove the following identities for hyperbolic functions:

(a) $\cosh(2x) = 2 \cosh^2 x - 1$;

(b) $\sinh(2x) = 2 \sinh x \cosh x$;

(c) $(\tanh x)' = \frac{1}{\cosh^2 x}$, where $\tanh x = \frac{\sinh x}{\cosh x}$.

2. Compute the following definite integrals:

(a) $\int_0^\pi x^2 \sin(2x) dx$;

(b) $\int_0^1 \frac{x^2}{1+x^2} dx$;

(c) $\int_1^2 (\frac{2}{x^{2/3}} - 3x^{3/2}) dx$;

(d) $\int_{-3}^2 |2x + 1| dx$.

3. Find the following indefinite integrals:

(a) $\int x^{17} \ln x dx$;

(b) $\int \arctan x dx$;

(c) $\int \sin^5 x dx$;

(d) $\int \cos^2 x dx$;

(e) $\int \cos^4 x dx$;

(f) $\int e^{2x} \arcsin(e^x) dx$.