

Problem Sheet 4

Deadline: **Monday 31 October, 5:00.**

Hand in to **the drop box** in the undergraduate common room (maths department, room 502).

Hand in the questions marked with an asterisk (*).

One mark will be deducted if you do not **staple your work**.

1) Find $\frac{dy}{dx}$ for each of the following. For (i) to (n) give the answer in terms of the parameter.

a) $y = \sin^{-1} x$

b) $y = \ln(x + 3)$

c) $y = \tan^{-1}(e^x)$

* d) $y = \cos(\ln x)$

e) $y = \sec^{-1} x$

* f) $y = \frac{1}{\cos^{-1} x}$

g) $y = \frac{\sin^{-1} x}{\cos^{-1} x}$

* h) $y = e^{\ln x}$

i) $x = t^2, y = t$

* j) $x = \sin \theta, y = \cos \theta$

* k) $x = \sin s, y = s$

l) $x = \sin^{-1} z, y = \cos^{-1} z$

m) $x = \cos \zeta, y = \tan \zeta$

n) $x = t^3 - t, y = t^2 + 5t$

2) Find the following:

a) $\int 5 \, dx$

b) $\int e^x \, dx$

c) $\int \sin x \, dx$

d) $\int 12x^3 - \cos x \, dx$

* e) $\int \frac{1}{\sqrt{x}} \, dx$

f) $\int 10^x \, dx$

g) $\int_0^2 5 \, dx$

* h) $\int_{\ln 1}^{\ln 11} e^x \, dx$

i) $\int_0^2 x^2 + \frac{1}{3} \, dx$

* j) $\int_0^{\frac{\pi}{2}} 10 \sin x \, dx$

* k) $\int_1^2 \frac{20}{x^2} \, dx$

* l) $\int_{-2}^3 2x + 1 \, dx$