

<http://timmel.chem.ox.ac.uk/lectures/>

**Differential Equations**

1. Solve the following Differential Equations:

a)  $dr + r \tan \phi d\phi = 0, r(\pi) = 2$

b)  $xy' - y - x = 0$

c)  $y' + 5y = 4x$

d)  $y' = \frac{x + y + 1}{2x + 2y - 2}$

e)  $y' + \frac{1}{2}y = 2x + 1$

2. Solve question 7-11 (9. DE) and questions 1-4 (10. Appl. of DE) in the problem booklet.

3. A body (eg, a rain drop) falls due to the gravitational force in a medium (eg, air). Assume the frictional resistance is proportional to the square of the velocity of fall. Calculate  $v=v(t)$ ! Give the proportionality constant if the maximum velocity of the falling body approaches  $v_0$  for  $t \rightarrow \infty$ .

4. A liquid flows at constant velocity  $v_0$ . A particle which enters this fluid is swept away by the current. The force on the particle is  $F = k(v_0 - v)^2$ ,  $k = \text{const}$ . Calculate  $v = v(t)$  with the initial condition  $v(0) = 0$ !