

Høsten 2015

# FYS100 Fysikk

## Problems week 41

Have a go at these. And for each, make a little sketch to illustrate the solution.

Some problems from the book:

- 7.17, 7.18, 7.31, 7.41, 7.44, 7.54

And then have a go at these:

### **Additional problem 1 (Obl 2013-3)**

A block is lying on a table and attached to a spring in the horizontal direction, and the spring is in turn attached to a wall. We take the x-axis to be positive in the direction of stretching the spring, and the equilibrium position of the spring is at  $x = 0$ . The block has mass  $m = 1.00$  kg, the spring constant is  $k = 100$  N/m and there is a coefficient of kinetic friction with the table of  $\mu_k = 0.15$ . There is gravity.

- If the block is let go from a position  $-x_0 = 10.0$  cm (compressed), how far does it stretch  $+x_1$  on the other side?
- And how far does it go when returning to the squeezing side  $-x_2$ ? And the next stretching  $x_3$ ?
- Make a plot of the compression/stretching points  $x_0, x_1, \dots$ . How many times does the spring oscillate before coming to a stop?

### **Additional problem 2 (Obl 2014-3)**

A man of mass 80.0 kg jumps out from a bridge, with a lightweight rubber rope attached to his feet. He falls 50.0 m before turning around and coming back up, which is 30.0 m further than the equilibrium point of the rubber band (without man), which we take to be like a spring when stretched (but not when squeezed; no spring force on the man until he has passed the equilibrium point).

In the following questions, you must provide algebraic equations as well as final numbers. You must also draw some relevant sketches, illustrating the problem. You may find energy bar diagrams useful in this problem.

- What is the effective spring constant of the rope?
- How fast is the man going when passing the equilibrium point on his way up again?