Matematisk modellering og numeriske metoder

Vink til opgaverne relateret til lektion 11

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Exercise 1

This exercise is straightforward.

Exercise 2

- This exercise is (unreasonably?) difficult, but I assume you have a lot of unsolved exercises from earlier lectures, so I don't suppose you'll be bored, even if this exercise is out of reach for you.
- Try with the product method: Make the Ansatz that the solution has the form $u(x,t) = F(x)G(t)$. You have already seen in Lecture 10 that this implies that

  $$F(x) = F_n(x) = a\cos(p_n x) + b\sin(p_n x) \qquad \text{and} \qquad G(t) = G_n(t) = b_n\cos(cp_n t) + a_n\sin(cp_n t)$$

  for suitable choices of p.
- Now use the boundary conditions to get $a = 0$ $p_n = \frac{(2n+1)\pi}{2L}$ (you need both boundary conditions for this).
- Now use (one of the) intial conditions to show that $a_n = 0$.
- Define $u_n(x,t) = F_n(x)G_n(t)$ and let $u = \sum_n u_n$. Use the other intial condition to show that $A_n = b_n = \frac{2}{L}\int_0^L f(x)\sin(p_n x)\,\mathrm{d}x$.