Answers to problem set 9
FYS4130 at UiO, Spring 2012

Jørgen Trømborg

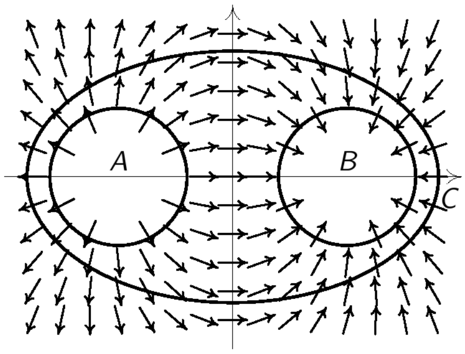
April 2012

9.1

B

9.2

a) $S_A = S_B = 1$, $S_C = 2$.

b) 

c) –

9.4

a) We take $B = \frac{g}{4!}m_0^4$ and find $F = \mathcal{F}\Delta = m_0^3\sqrt{\frac{gK}{3}}$ with $\Delta = \frac{4}{m_0}\sqrt{\frac{3K}{g}}$.

b) $K\frac{\partial^2 m}{\partial x^2} = \frac{g}{6}m(m^2 - m_0^2)$

c) –

d) $m = m_0 \tanh\left(\frac{m_0}{2}\sqrt{\frac{g}{3K}}x\right)$, which has a wall thickness equal to our estimate in a) down to an arbitrary numerical constant of order 1 (from the freedom of choice in defining the extent of the rapidly changing part of the tanh() function).

10.9

a)

$$
\begin{aligned}
\Omega_k &= \pm\sqrt{c^2k^2 - \frac{d^4k^4}{4}} + i\frac{d^2k^2}{2} \\
\omega_k &= \mathrm{Re}(\Omega_k) \\
\Gamma_k &= -\mathrm{Im}(\Omega_k)
\end{aligned}
$$

Q_k diverges as k^{-1} as $k \to 0$.

b) The real part of ω_k vanishes at $\lambda = \frac{\pi d^2}{c}$.

c) Only a) and b) were assigned.