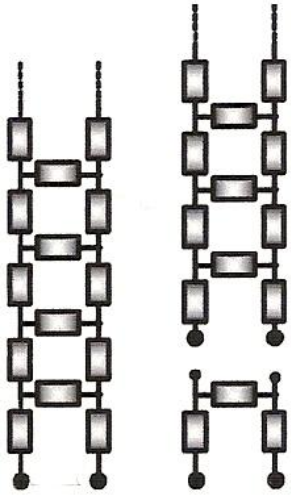
Elektromagnetismens grunder I Övning 2, vecka 5 (27.01) våren 09

1. Vad är den totala resistansen mellan de svarta cirklarna för den oändliga stegen av 1 Ω motstånd som är avbildad i **figur 1a.**

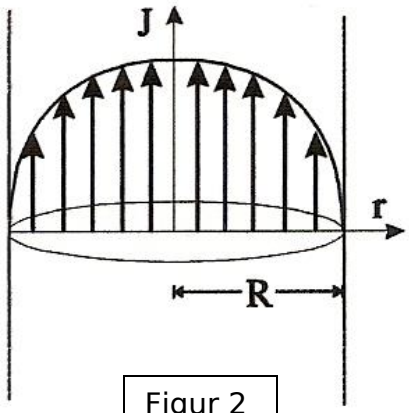
*Tips: betrakta **figur 1b** där man har adderat ytterligare tre motstånd som är parallellt kopplade med de oändliga stegen.*



Figur 1a

Figur 1b

2. Strömdensiteten, J, i en cylindrisk ledning med radien R är en funktion på avståndet r enligt följande formel: $J = J_0\left(1 - \frac{r^2}{R^2}\right)$. Beräkna den totala strömmen längs ledningen.

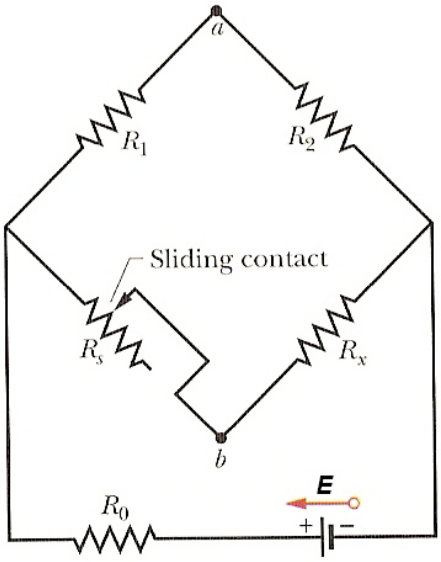


Figur 2

3. If points **a** and **b** in **figure 3** are connected by a wire of resistance *r*, show that the current in the wire is

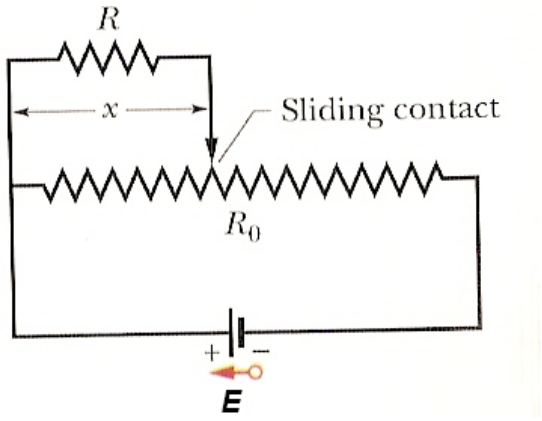
$$i = \frac{E(R_s - R_x)}{(R+2r)(R_s + R_x) + 2R_s R_x},$$

where *E* is the emf of the ideal battery and $R = R_1 = R_2$. Assume that R_0 equals zero.



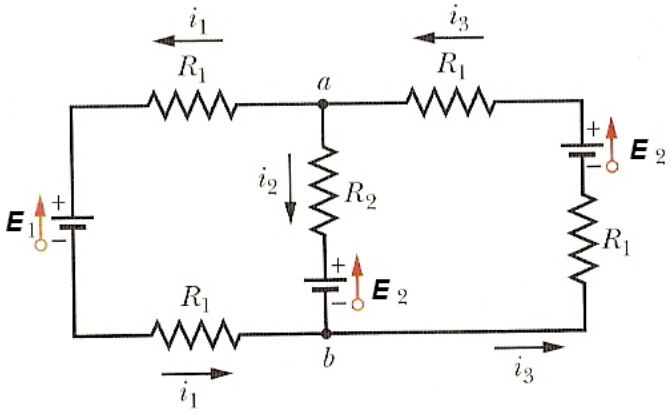
Figur 3

4. **Figure 4** shows a battery connected across a uniform resistor R_0. A sliding contact can move across the resistor from $x = 0$ at the left to $x = 10cm$ at the right. Moving the contact changes how much resistance is to the left of the contact and how much is to the right. Find an expression for the power dissipated in the resistance resistor *R* as a function of *x*. Plot the function for $E = 50V$, $R = 2000\Omega$, and $R_0 = 100\Omega$.



Figur 4

5. Figure shows a circuit whose elements have the following values: $E_1 = 3.0V$, $E_2 = 6.0V$, $R_1 = 2.0\Omega$, $R_2 = 4.0\Omega$. The three batteries are ideal batteries. Find the magnitude and the direction of the current in each of the three branches.



Figur 5