

Set 2— due 15 September

“I don’t see why you are talking about this problem when either of you is capable of sitting down and solving it.” – H. Bethe, to his students

Several problems involving images.

1) Jackson 2.1 [15 points] This should just be a review... (a)-3, (b)-2 (c)-3, (d)-2, (e)-2, (f)-3

2) Jackson 2.7 [20 points] Not quite identical to the previous one. (a)-3, (b)-3, (c)-4, (d)-10

3) Jackson 2.11 [20 points] Do this one before trying the next one! (a+b)-12, (c)-5, (d) 3.

A useful hint: if the quantity

$$\frac{A + B \cos \theta}{C + D \cos \theta} \quad (1)$$

is supposed to be independent of θ , then $A/C = B/D$.

4) Jackson 2.8 parts a-b only [20 points]. I found it hard to get the answer quoted in the text. Here are two potentially useful hints:

Hint 1: If $x = \ln z$ and $\cosh^{-1} y = x$, then $y = (z + 1/z)/2$.

Hint 2: You probably have two equations giving d as a function of a , b , and the offsets of the image wires from the centers of the cylinders (call them d_1 and d_2). Try multiplying them together to give d^2 . If you don’t understand this, and can work the problem in some other way, ignore the hint! (The reason why Jackson’s answer for the capacitance is desirable is that it only depends on simple paramters, the radii of the two cylinders and their separation.)