PSP: This assignment is designed to test your understanding of the current chapter's content. You will be required to solve the problem AND briefly explain your solution using the model provided. Answering the question without explanation will result in a grade of 20% for the assignment.

1) A 100 km long high-tension power line is made of aluminum. It has a conductor that is 2.5 inches in diameter. Answer the following questions...

   a) Determine the resistivity of the aluminum at 5°C
   b) Determine the resistance of the power line.
   c) Determine the current through the power line
   d) Determine the power lost through the power line if it carries 400,000V

✳ assuming everything is connected

$d = 2.5 in = 6.35 cm = 0.0635 m$

$l = 100 km = 100 000 m$

$r = \frac{d}{2} = 0.03175 m$

a) $\rho_T = \rho_0 \left(1 + \alpha\left(T - T_0\right)\right) = 2.65 e{-8} \left(1 + 0.0039 \left(5 - 20\right)\right) = 2.495 e{-8} \ \Omega m$

b) $R = \rho \frac{l}{A} = \rho \frac{l}{\pi r^2} = 2.495 e{-8} \ \frac{100\,000}{\pi \, 0.03175^2} = 0.7878 \ \Omega$

   (assuming cylindrical shaped wire)

c) $V = IR, \quad I = \frac{V}{R} = \frac{400\,000}{0.7878} = 507728.0124 \ A$ (assuming situation in d)

d) $P = IV = 507728.0124 \cdot 400000 = 2.03 e11 \ W$

_____ / 10pts