

E11: Autonomous Vehicles

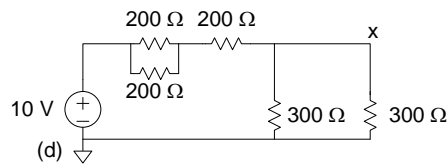
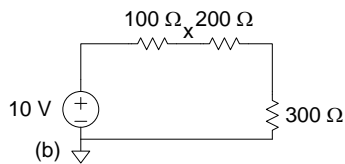
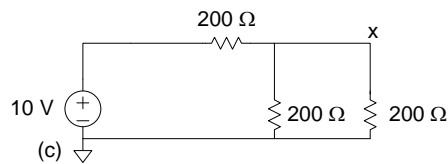
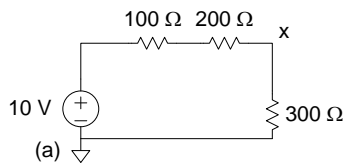
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Problem Set 4: Volts and Amps and Ohms, Oh My!

1. Resistor Circuits

Find the voltage at node x in each of the following circuit. (Hint: series and parallel combinations and the voltage divider equation can make this doable by inspection.)



2. Solar Panel

You are considering replacing the pesky battery on your autonomous vehicle with a solar panel so that it can undertake a lengthy foray to raid the Caltech cannon. The solar cell has the nonlinear current-voltage profile given in the following figure. Assume that you can model the rest of your autonomous vehicle as an equivalent resistance, R_{bot} .

- If the robot looks like a short circuit ($R_{\text{bot}} = 0$), how much current, I_{bot} , will it draw from the solar cell? How much voltage, V_{bot} , will it receive? How much power, P_{bot} , will it obtain from the solar cell?
- If the robot looks like an open circuit ($R_{\text{bot}} = \infty$), compute I_{bot} , V_{bot} , and P_{bot} .
- What is equivalent resistance, R_{bot} , that maximizes the power delivered to the robot? What is I_{bot} , V_{bot} , P_{bot} ?



Solar Cell (source: sparkfun.com)

