

(5pts) Problem 21

The starter motor in a 12V automobile ignition system has an internal resistance of 0.05 ohms.

- (1pt) a) When a full 12 volts is applied to the starter motor, how much current does it draw?

$$V = IR$$

$$I = \frac{V}{R} = \frac{12V}{0.05\Omega} = \boxed{240 A}$$

- (1pt) b) If the battery cables going to and from the starter motor have a combined resistance of 0.01 ohms, how much current is drawn by the starter motor?

$$R_{\text{TOTAL}} = 0.01 + 0.05 = 0.06\Omega$$

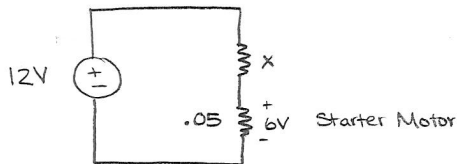
$$V = IR$$

$$I = \frac{V}{R} = \frac{12V}{0.06\Omega} = \boxed{200 A}$$

- (1pt) c) Under the conditions of (b), how much voltage appears across the starter motor?

$$V = IR = (200A)(0.05) = \boxed{10 \text{ Volts}}$$

- (2pts) d) What amount of resistance in the battery cables would drop the voltage across the starter motor to 6 Volts?



In order to get 6V
 $x = .05$ (to get a 6V drop)