

17. (a) Using Eq. 28-4, we take the derivative of the power  $P = i^2 R$  with respect to  $R$  and set the result equal to zero:

$$\frac{dP}{dR} = \frac{d}{dR} \left( \frac{\mathcal{E}^2 R}{(R+r)^2} \right) = \frac{\mathcal{E}^2 (r-R)}{(R+r)^3} = 0$$

which clearly has the solution  $R = r$ .

- (b) When  $R = r$ , the power dissipated in the external resistor equals

$$P_{\max} = \left. \frac{\mathcal{E}^2 R}{(R+r)^2} \right|_{R=r} = \frac{\mathcal{E}^2}{4r} .$$