1. Show that:
   
   (a) \( \exp(a - b) = \frac{\exp(a)}{\exp(b)} \)
   
   (b) \( (\exp(a))^q = \exp(qa) \) where \( q \in \mathbb{Q} \).

2. Define \( a^b = \exp(b \ln(a)) \). Prove the following (notice we have already shown all of these when the exponent is rational):

   (a) \( a^{b+c} = a^b a^c \)
   
   (b) \( a^{b-c} = \frac{a^b}{a^c} \)
   
   (c) \( (\exp(a))^b = \exp(ba) \)
   
   (d) \( (a^b)^c = a^{bc} \)
   
   (e) \( D_x(x^a) = ax^{a-1} \)
   
   (f) \( D_x(a^x) = \ln(a)a^x \).