1. Find all nondecreasing functions \( f : \mathbb{R} \to \mathbb{R} \) such that
   
   (a) \( f(0) = 0, \ f(1) = 1; \)
   
   (b) \( f(a) + f(b) = f(a)f(b) + f(a + b - ab) \) for all real numbers \( a, b \) such that \( a < 1 < b. \)

2. Let \( \Gamma_1, \Gamma_2, \Gamma_3 \) and \( \Gamma_4 \) be distinct circles such that \( \Gamma_1, \Gamma_3 \) are externally tangent at \( P, \) and \( \Gamma_2, \Gamma_4 \) are externally tangent at the same point \( P. \) Suppose that \( \Gamma_1 \) and \( \Gamma_2; \Gamma_2 \) and \( \Gamma_3; \Gamma_3 \) and \( \Gamma_4; \Gamma_4 \) and \( \Gamma_1 \) meet at \( A, B, C \) and \( D, \) and that these points are different from \( P. \)

   Prove that
   
   \[
   \frac{AB \cdot BC}{AD \cdot DC} = \frac{PB^2}{PD^2}.
   \]

3. Each positive integer \( a \) (written in base 10 notation) undergoes the following procedure in order to obtain the number \( d = d(a): \)
   
   (a) move the last digit of \( a \) to the first position to obtain the number \( b; \)
   
   (b) square \( b \) to obtain the number \( c; \)
   
   (c) move the first digit of \( c \) to the end to obtain the number \( d. \)

(For example, for \( a = 2003, \) we get \( b = 3200, \ c = 10240000, \) and \( d = 02400001 = 240001 = d(2003). \))

Find all numbers \( a \) for which \( d(a) = a^2. \)