1. You are given the following:

(a) \( \delta(t) = \frac{2t^3 + 8t}{t^4 + 8t^2 + 16}, \quad 0 \leq t \leq 1, \)

(b) \( i = \) equivalent annual effective rate over the first year, given \( \delta(t) \) in (a),

(c) Fund X accumulates with simple interest at rate \( i \).

(d) Fund Y accumulates with force of interest \( \delta(t) \),

(e) An amount of 1 is deposited in each of Fund X and Fund Y at time \( t = 0 \).

At what time \( t \) is (Fund X - Fund Y) a maximum?

2. An amount \( X \) is deposited into an account that pays 8\% simple interest. At the same time \( X/2 \) is deposited into an account that accumulates at a constant force of interest \( \delta \). The total interest earned in each account after 10 years is the same. Find \( \delta \).

3. Fund X starts with 1,000 and accumulates with a force of interest \( \delta(t) = 1/(15-t) \) for \( 0 \leq t < 15 \). Fund Y starts with 1,000 and accumulates with an interest rate of 8\% per annum compounded semiannually for the first three years and an effective rate of \( i \) per annum thereafter. Fund X equals Fund Y at the end of four years. Calculate \( i \).

4. An investment of 1 will double in 27.72 years at force of interest \( \delta \). An investment of 1 will increase to 7.04 in \( n \) years at a nominal rate of interest equal to \( \delta \) and convertible once every 2 years. Calculate \( n \).

5. Elsie makes deposits into an account of 100 today and 200 twelve years later. For the first twelve years interest is credited at an annual nominal rate of 6\% convertible quarterly. For the next 8 years the account earns at a force of interest of \( \delta \). At the end of 20 years the accumulated amount is 802. Find \( \delta \).