TS Module 8: Non-stationary time series basics HW

(The attached PDF file has better formatting.)

Homework assignment: Stationarity through differencing and logarithms

- Automobile liability claim severities have a geometric trend of +8% per annum.
- The average claim severity in year t is the average claim severity in year t-1 adjusted for the geometric trend, plus or minus a random error term.
  - Assume the error term is added to the logarithm of the average claim severities.
  - ⇛ The average claim severities are multiplied by a random error term.

A. Is the time series of average claim severities stationary?
B. Is the first difference of this time series stationary?
C. Is the second difference of this time series stationary?
D. Is the logarithm of this time series stationary?
E. What transformation makes the time series stationary?

Jacob: What is the form of this time series?

Rachel: Actuaries write: $Y_t = 1.08\ Y_{t-1}$. The error term is multiplicative: $Y_t = 1.08\ Y_{t-1} \times (1 + \epsilon)$.

A separate discussion forum posting shows the solution.