University of Texas at Austin

Quiz #8

The log-normal distribution. Log-normal stock prices.

Provide your **complete solution** to the following problems. Final answers only, without appropriate justification, will receive zero points even if correct.

Problem 8.1. (5 points) *Source: Problem 18.6 in McDonald.*
Let $X \sim N(mean = 2, variance = 5)$.
   (i) (3 points) Find $\mathbb{E}[e^X]$.
  (ii) (2 points) Find the median of e^X.

Problem 8.2. (2 points) The product of log-normal random variables is normal. *True or false?*

Problem 8.3. (2 points) The mean of a lognormal stock price is at most as large as its median. *True or false?*

Problem 8.4. Let $S(t)$ denote the time$-t$ stock price for $t \geq 0$. Let us use the Black-Scholes framework for the stock price. Then, the random variable
$$\ln\left(\frac{S(t)}{S(0)}\right)$$
has the log-normal distribution for every t. *True or false?*

Problem 8.5. (5 points)
Assume the Black-Scholes framework for stock prices, i.e., assume the lognormal distribution of the stock prices. Let the mean rate of appreciation on a stock be 0.05 and let its volatility be equal to 0.25.
The continuously compounded risk-free interest rate is 0.04.
What is the probability that the stock will have a positive return over the period of two years?
  (a) 0.5438
  (b) 0.7704
  (c) 0.8554
  (d) 1
  (e) None of the above.