Challenging Problem 1: Continuous Compounding
Foundations of Financial Markets
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As described in RWJ 5.3., a quoted rate of $Q$, which is compounded $m$ times a year, corresponds to an effective annual rate ($EAR$) of

$$EAR = (1 + Q/m)^m - 1.$$  

Consider an increasingly frequent compounding: every quarter, every week, every day, every second, and so on. What happens to the effective annual rate as the number of compounding periods increases without bound, that is, what is the limit of $EAR$ as $m \to \infty$?

The limit rate is called the interest rate with continuous compounding.

Hint: Determine first the limit of

$$\log ((1 + Q/m)^m) = m \log (1 + Q/m).$$