Understanding exponential functions

Taylor Series

$e^x = 1 + x + x^2/2! + x^3/3! + \ldots x^n/n! = \sum_{n=0}^{\infty} x^n / n!$

A Learning Curve

(why you get better with time, assuming other to be variables constant)

Q = amount of specific knowledge
At any time *t*, Q changes at a rate proportional to the amount of Q present.

$dQ/dt = k\,Q$ (k must have units of t^{-1}, i.e., a rate)

$dQ/Q = k\,dt$

$Q = Q_0\, e^{kt}$ (unbounded growth at rate kQ)

Alternately for asymptotic growth to Q_f:

$Q = Q_f\,(1 - e^{-kt})$ (Q increases from 0 to Q_f)

Understanding the solar cell device

1. **Electronic design**
    a. **semiconductor material**
    b. **p-n junction**
    c. **top contact**
    d. **bottom contact**
    e. **backside electric field**
    f. **interface passivation**
2. **Photonic design**
    a. **Anti-Reflection (AR) coating**
    b. **Lambertian frontside texture**
    c. **backside diffractive element**
    d. **backside reflector**

3.003 Principles of Engineering Practice

Spring 2010