Worksheet XIV: A Brief introduction to probability

*Definitions:*

* f(x) is a *probability density function* (pdf) for *X* if

the probability that  is 

* The *Mean* value for *X* with probability density function f(x) is

 (the weighted average value of x)

* The *Median* value for *X* with probability density function f(x) is a value *T* such that



The probability density function for the *exponential distribution* in general (where ** > 0):



The mean = 1**

**Example:** The probability density function for the time until failure for a smart phone chip is given by

, where *x* is measured in weeks.

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| A. Sketch a graph of f(x), the pdf: | B. Find the probability that a chip fails in the first 5 weeks: |
| C. Find the probability that a chip does NOT fail in the first 5 weeks: | |
| D. Find the probability that the chip fails at a time between 5 and 20 weeks. | |
| E. Find the probability that the chip lasts longer than 36 weeks: | |
| F. Find the *median failure time* for this chip:  median = *T*, where Prob( X ≤ *T* ) = 0.5. | G. Find the *mean failure time* for this chip:  Mean = weighted average = |

*The most important questions in life are, for the most part, really only problems of probability.*

- Pierre Simon de La Place