## Plan for the exercise

- $\star$  From f(t), find S(t) and lpha(t) for the exponential distribution
- \* Problem 1.3 in ABG: Show  $E(T) = \int_0^\infty S(t) dt$ 
  - use this to find E[T] in exponential and Weibull distribution
- $\star$  Problem 1.9 in ABG: Truncated and censored survival times
  - survival function for left-truncated survival times
  - hazard rate for left-truncated survival times
  - intensity process for trucated and right-censored survival times

## Relations between f(t), F(t), $\alpha(t)$ , S(t) and A(t)

$$f(t) = F'(t)$$

$$F(t) = \int_0^t f(s)ds$$

$$S(t) = 1 - F(t)$$

$$f(t) = -S'(t)$$

$$A(t) = \int_0^t \alpha(s)ds$$

$$\alpha(t) = A'(t)$$

$$\alpha(t) = -\frac{d}{dt}\ln S(t)$$

$$S(t) = \exp\{-A(t)\}$$

Counting process and the intensity process

★ Counting process:

- consider particular type of event
- at most one event happens in short time interval (t, t + dt]
- N(t): # of events from time 0 to time (including) time t
- increment: dN(t) = N(t + dt) N(t)
- \* Intensity process  $\lambda(t)$ :

$$\lambda(t)dt = P(dN(t) = 1|past) = E[dN(t)|past]$$

★ Corresponding martingale

$$M(t) = N(t) - \int_0^t \lambda(s) ds$$