1.010 Uncertainty in Engineering
Fall 2008

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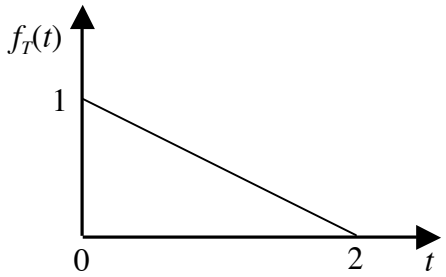
Homework Set #4
Due October 9, 2008 (in class)

1. Calculate and plot the hazard function for the lifetime distribution shown below.



2. Read *Application Example* 7 and do the following:

For a given suburb of Boston and a certain route, the commuting time D depends on traffic conditions T and weather W. Specifically, the random variable $(D|T,W)$ has exponential distribution with parameter λ that depends on T and W. The probability of various combinations of T and W and the associated values of λ (in min^{-1}) are:

W	T	$P[T \cap W]$	λ (min^{-1})
good	light	0.25	1/30
good	normal	0.40	1/35
good	heavy	0.15	1/55
bad	light	0.03	1/35
bad	normal	0.07	1/42
bad	heavy	0.10	1/70
		$\sum = 1.00$	

Find the probability density function of D, $f_D(d)$, using a relation analogous to Eq. 2 of Application Example 7. Plot this density function. Is it an exponential density? Calculate the unconditional probability that D>40 minutes?

3. The joint probability mass function of precipitation depth X (mm) at a raingauge station and flow Y (m^3/s) of a nearby river is as follows:

	X=25	X=50	X=75
Y=2	0.05	0.12	0
Y=4	0.11	0.30	0.10
Y=6	0	0.12	0.20

a) Find the marginal PMFs of X and Y.
b) If the raingauge indicates a precipitation of 50mm, what is the probability that the flow exceeds 4 m^3/s?