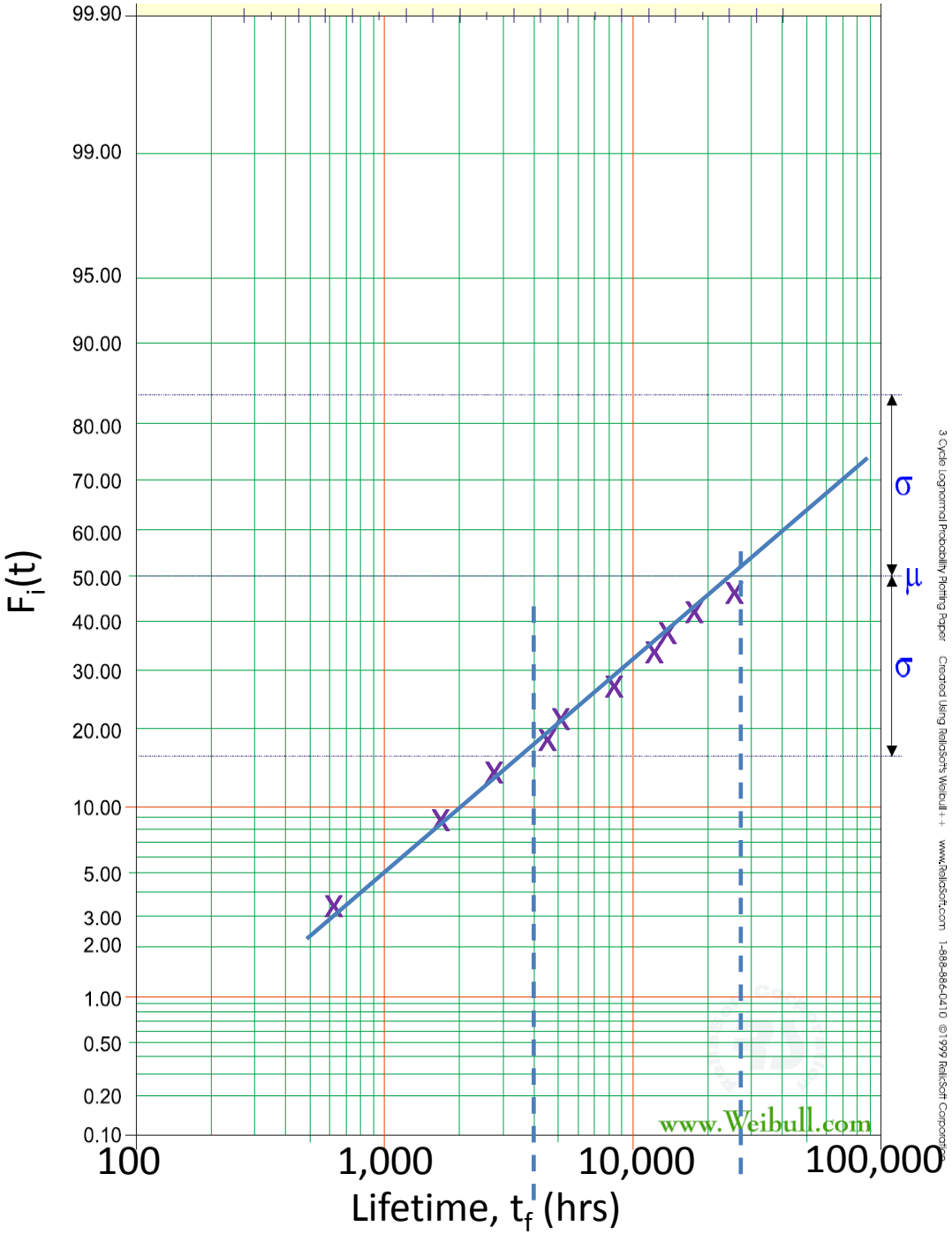
EEE6008 Problem question solution – Reliability mathematics

1) Rank the data using Bernard's approximation: $F_i = \frac{i - 0.3}{N + 0.4} \times 100$

Rank, i	t_f	$F_i(t)$
1	700	3.431373
2	1900	8.333333
3	3000	13.23529
4	4400	18.13725
5	5500	23.03922
6	9300	27.94118
7	11500	32.84314
8	11900	37.7451
9	16100	42.64706
10	25200	47.54902

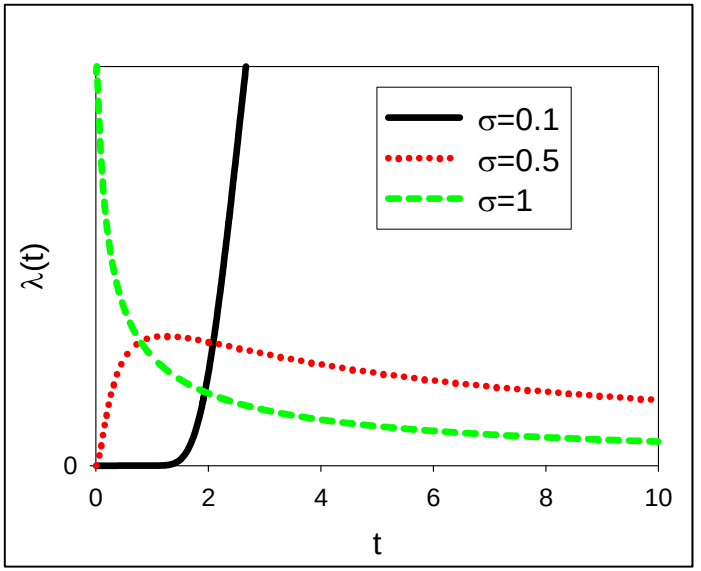


2)

σ= ln(25,000)-ln(4000) = 1.83

Suggests failure rate high at first, then settles to ~constant.

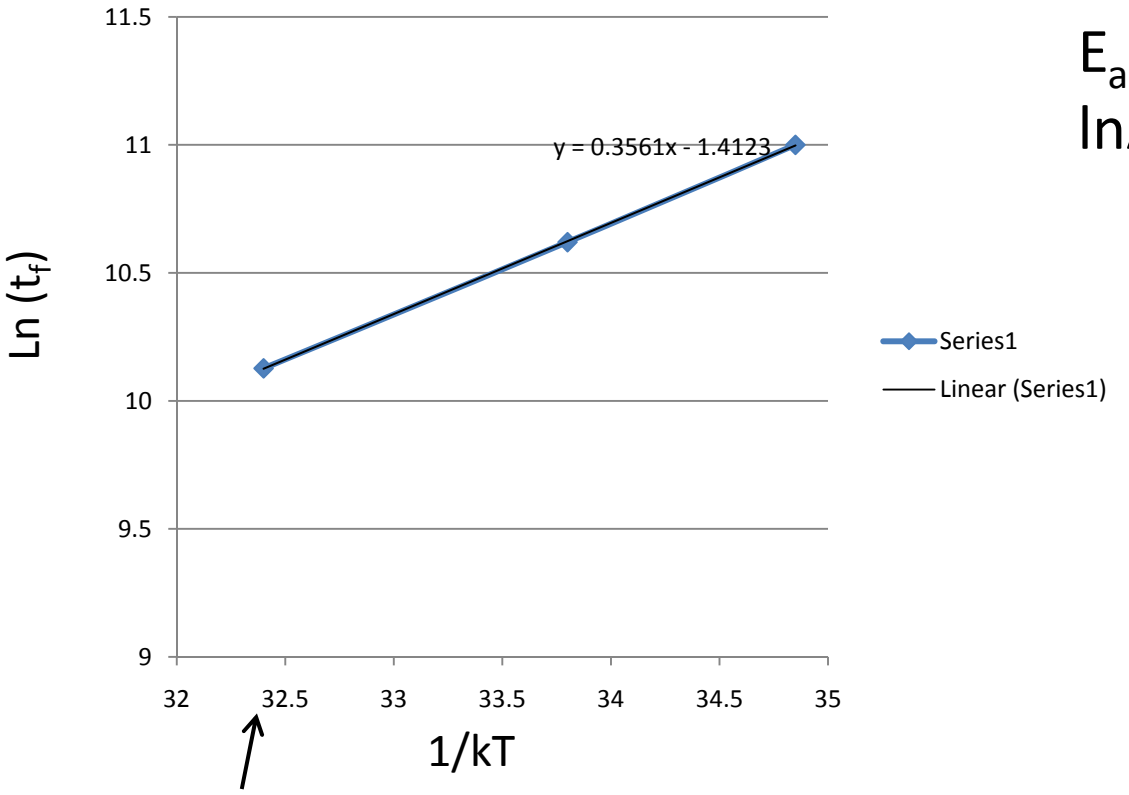
Reminder, from notes:



(On Weibull, β~0.7)

3) MTTF ~25,000 hours

4) Arrhenius plot: plot $\ln(t_f)$ as function of 1/kT



E_a = 0.356eV

lnA = -1.4123, so A = 0.244

85°C = 358K

MTTF (20°C) = $A\exp(E_a/kT)$

= $0.244\exp(0.356/k293)$

= 324,200hours ~37 years!