Math 402 HW 6 Spring 2023. Due Friday, March 10. Quiz 6 Wed. March 8. Exam 2 Wednesday March 29. Cumulative Final: Friday, May 12, 10:15-12:15.

1) Times (in years) until death are given for 9 people from Dickson, Mary, and Waters (problem 18.1 modified, 2020, p. 690).
27, 30+, 34, 58+, 68, 68+, 70, 77, 78+

a) Compute the Kaplan Meier survival function $\hat{S}_K(t_i)$ by making a table of the data with headers as done in class.

b) Use Greenwood's formula to find $SE(\hat{S}_K(69))$, an estimate of the standard deviation of $\hat{S}_K(69)$.

2) Suppose 10000 lives are observed from exact age 50 for 30 years, giving the table below.

age last birthday	deaths
50–59	170
60–69	465
70–74	552
75–79	968

a) Find $\hat{S}_{50}(t)$ for the four possible values of t using a table with headers as done in class.

b) Find the ogive empirical survival function at $t = 28$.

3)

j	t_j	d_j	r_j	$\hat{S}_K(t_j)$
1	1	3	15	
2	2	24	80	
3	3	5	25	
4	4	6	60	
5	5	3	10	

a) Fill in the above table on a separate page, where $\hat{S}_K(t_j)$ is the Kaplan Meier product limit estimator.

b) Find $\hat{H}_N(5)$.

c) Use b) to find $\hat{S}_N(5)$.

d) Find $\hat{S}_K(5)$.

e) Determine the Greenwood approximation for the variance of the Kaplan Meier product limit estimator $\hat{S}_K(4)$.

Hint: See old quiz 6. **Over for more problems.**

4) For a discrete whole life insurance of 150,000 on x, you are given ${}^2A_x = 0.0143$, $A_x = 0.0653$, and the annual premium is calculated using the equivalence principle. Calculate the standard deviation of the loss variable L.

Hint: For unit payment, say $V[L_x(1)]$,

$$V(L_x(1)) = \frac{{}^2A_x - (A_x)^2}{(1 - A_x)^2}.$$

See Exam 2 review 116 i). Then for payment $X = 150000$, $V[L_x(X)] = X^2 V[L_x(1)]$. Want $V[L_x(X)]$. Here $L_x(X) = {}_0L_x$. (May 2007 SOA exam problem 4.)

5) Get the illustrative life table. Assume mortality follows the illustrative life table and $i = 0.06$. Find the premium for a fully discrete whole life insurance of 1000 on (40).

Hint: see MLC 27 and use Exam 2 review 115 i) to get the premium for 1 unit. Then multiply this formula by 1000. Note that the table gives $1000A_x$.