1, p. 44, footnote 17: $e^{-(\lambda+\mu)}$ $(\lambda^i \mu^j$ / i! j!).

By the Binomial Theorem, these terms sum to $e^{-(\lambda+\mu)}$ $(\lambda+\mu)^k$ / k!.

1, p.99, footnote 31: f(0) = $1/(1+\beta)^r$

1, p.113, solutions 6.4-6.5, comment: f(0) = $1/(1+\beta)^r$

1, p. 361, line 12: $= n!\, \theta^{n+1} \{1 - \sum_{i=0}^{n} \frac{(x/\theta)^i e^{-x/\theta}}{i!}\}$

1, p. 363, line 5: x > **0**

1, p. 367, sol. 18.5:

$$\int_4^8 t\, e^{-t/5}\, dt = \int_0^8 t\, e^{-t/5}\, dt - \int_0^4 t\, e^{-t/5}\, dt = (5^2)\{1 - e^{-x/5} - (x/5)e^{-x/5}\}\Big]_{x=4}^{x=8} =$$

(25) $\{e^{-4/5} + (4/5)e^{-4/5} - e^{-8/5} - (8/5)e^{-8/5}\}$ = 7.10. Final solution is OK.

1, p. 370, five lines from the bottom: $= \int_0^\infty \frac{\lambda^n e^{-\lambda}}{n!} \frac{\lambda^{\alpha-1} e^{-\lambda/\theta}}{\theta^\alpha \Gamma(\alpha)}$

3, p.30: X = 3 and Y = 1, with probability: (0.4)(0.2) = 0.**0**8,
X = 4 and Y = 0, with probability: (0.1)(0.5) = 0.**0**5.
The density at 4 of X + Y is the sum of these probabilities: 0 + 0.**0**8 + 0.**0**5 = 0.13.

3, p.220, comment on solution to exercise:
Commonly one does **not** apply the continuity correction when working on aggregate losses; however, here the severity is either 0, 1, 2, or 3, so using the continuity correction makes sense.

6, p.133, sol. 6.59: Alternately, $K_2(x)$ is uniform from 1 to **4**, $K_5(x)$ is uniform from 4 to **7**.
Thus the kernel smoothed density is:
(1/3) (uniform from 1 to **4**) + (1/3) (uniform from 4 to **7**) + (1/3) (uniform from 7 to 10) =
uniform from 1 to 10.
Final answer is OK.

6, p. 243, 4th paragraph, there are should not be an n before ln(3):
This differs by: 2ln(x) + ln(3), from the log density of the Weibull (for $\tau = 3$) of:
$-\theta^{-3}x^3 + 2\ln(x) - 3\ln(\theta) + \ln(3)$.

6, p. 246 above the exercise: $0 = n/a + \sum \ln[x_i] - n \ln[\theta]$. $\Rightarrow$ $n/a = -\sum_{i=1}^{n} \ln[x_i / \theta]$. $\Rightarrow$ $\hat{a} = \dfrac{-n}{\sum_{i=1}^{n} \ln[x_i / \theta]}$

6, p.247, fifth line: $n \ln[a] + n \ln[a+1] + (a-1) \sum \ln[x_i]$ **+** $\sum \ln[1 - x_i / \theta] - n\, a \ln[\theta]$.

6, p.301, solution 10.44: $\ln f(x) = -(x - \theta)^2/2$ **+** $\ln(2/\pi)/2$.
loglikelihood is: $-\Sigma(x_i - \theta)^2/2$ **+** $n \ln(2/\pi)/2$.

6, page 696, sol. 22.23: What I calculated was the probability that if there is a <u>loss</u> it would result in a payment of size greater than 2000. What was asked for is the probability that if there is a <u>payment</u> it would result in a payment of size greater than 2000.
Under the franchise deductible, there is a payment if the loss is greater than 250, and that payment is greater than 2000 if the loss is greater than 2000.
The probability that if there is a <u>payment</u> it would result in a payment of size greater than 2000:
S(2000) / S(250) = exp[-2000/630] / exp[-250/630] = **6.2%**. Letter choice **C**.

6, page 776, solution to the first exercise: $= \mathrm{Var}[X_1 + X_2 + X_3 + X_4 + X_{\mathbf{5}}]/5^2$

6, page 784, 3rd line, no minus sign: $\varepsilon^2 \int_{-\infty}^{c-\varepsilon} f(\psi_n)\, d\psi_n + \varepsilon^2 \int_{c+\varepsilon}^{\infty} f(\psi_n)\, d\psi_n$

6, page 900: $E[\dfrac{\partial^2 \ln f}{\partial \theta^2}] = -\dfrac{\alpha}{\theta^2} + (\alpha+1)\dfrac{\alpha}{(\alpha + 2)\, \theta^2}$

7, p. 362, sol. 10.6: Linearly interpolating, x = (25)(**3.38**/7.38) + (50)(**4**/7.38)) = **38.55**.

7, p. 367, sol. 10.21: $\hat{p}_{91}$ = exp[-220/790] = **0.7569**.
${}_3\hat{p}_{90} = \hat{p}_{90}\, \hat{p}_{91}\, \hat{p}_{92}$ = (0.8056)(0.7569)(0.7408) = 0.4517. ${}_3\hat{q}_{90}$ = 1 - 0.4517 = **54.8%**.

9, p. 214, last line: = 60.0**18**

9, p. 282, sol. 6.45-6.46, first line: $\lambda > \mathbf{0}$.

9, p. 671, line 7: $0 = \frac{\partial \sum \frac{(x_i - y)^2}{n}}{\partial y} = \frac{\mathbf{2}}{\mathbf{n}} \sum (x_i - y)$.

10, p. 68, line 6: $= n!\, \theta^{n+1}\{1 - \sum_{i=0}^{n} \frac{(x / \theta)^i\, e^{-x/\theta}}{i!}\}$

10, p. 69, line 5: $x > \mathbf{0}$

10, p. 69, solution ot the first exercise: $= \frac{\Gamma(\alpha+1)}{\Gamma(\alpha)}\, \theta = \alpha\theta$.

10, p.73, line 12: $= \int_0^\infty \frac{\lambda^n e^{-\lambda}}{n!} \frac{\lambda^{\alpha-1} e^{-\lambda/\theta}}{\theta^\alpha \Gamma(\alpha)}$

10, p.143, sol. 4.74: (6)(**0.04**) = 0.24.

10, p.232, solution to the exercise: $\frac{(12)\ (\mathbf{13})}{(12 + 17)\ (12 + 17 + 1)} = 0.1793$.

10, p.300, six lines from the bottom: $f(m) = \frac{\exp[-(m-7)^2 / 8]}{2\sqrt{2\pi}}$

7, p. 287, revise Q. 8.19:

8.19 (Course 160 Sample Exam #2, 1996, Q.15) (1.9 points)

For a sample of 5 policyholders you are given:

(i) An anniversary-to-anniversary study, starts January 1, 1982 and ends December 31, 1986.

(ii) Insuring age nearest birthday are used throughout.

(iii) Each month is approximated by 1/12 of a year.

(iv) $\mu^{(d)}$ is the constant force of mortality over (56, 57].

Person	Date of Birth	Date of Policy Issue	Date of Death	Date of Withdrawal
1	6/1/26	5/1/81	---	---
2	2/1/29	1/1/83	6/1/85	---
3	1/1/28	12/1/83	---	---
4	7/1/29	3/1/84	---	11/1/85
5	8/1/30	9/1/85	8/1/87	---

Calculate the maximum likelihood estimate of $\mu^{(d)}$.

(A) 0.21 (B) 0.24 (C) 0.32 (D) 0.41 (E) 0.49

Note: I have rewritten this past exam question in order to match the current syllabus.

In the United States, 6/1/26 means June 1, 1926.

8.19. C. 1. Assigned insuring age 55 on 5/1/81. 56 on 5/1/82. 12 months of exposure.

2. Assigned insuring age 54 on 1/1/83. Died at 56 years and 5 months. 5 months of exposure.

3. Assigned insuring age 56 on 12/1/83. 12 months of exposure.

4. Assigned insuring age 55 on 3/1/84. Turned 56 on 3/1/85.

Withdrew at 56 and 8 months. 8 months of exposure.

5. Assigned insuring age 55 on 9/1/85. Turned 56 on 9/1/86.

But leaves the study on 9/1/86. $\Rightarrow$ No exposures, and the death on 8/1/87 is not included.

With a constant hazard rate, maximum likelihood is equal to the exact exposure method.

$e_{56} = 12 + 5 + 12 + 8 = 37$ months $= 37/12$ years. $d_{56} = 1$.

Thus, the maximum likelihood estimate of $\mu^{(d)}$ is : 1 / (37/12) = 12/37 = **0.3243**.

Comment: In an anniversary-to-anniversary study, possible observation of an individual policyholder begins on its first policy anniversary date following (or on) the starting date of the study, and ends on its last anniversary date prior to the ending date of the study.