ECE 203: Probability and Statistics I
University of Waterloo

Homework No. 1

Chapter 2: Do problems 1, 2, 3, 5, 6, 9, 10, 12, 14, 19, 23, 24, 36 and theoretical excercises 3, 10, 11, 12, 13.

Clarifications:
2. Let E_n be the event that the first 6 is obtained on the nth roll.

Homework No. 2

Chapter 3: Do problems 1, 2, 4, 5, 7, 10, 12, 13, 14, 16, 18, 19, 20ac, 25, 28, 32, 33, 34, 35, 38, 39, 45, 47, 51, 52, 53, 54, 55, 56, 57a, 58, 60, 63a, 70a, 72, 74, 76, 77, 79, 94ab, 95
and theoretical excercises 1, 2, 4, 5, 6, 8, 9, 11, 25, 28.

Problem Clarifications:
35. Assume if Joe is not late, then he is early.
52. replace "If policyholder A" with "If a random person"
55. Modify the last sentence to "If A independently wins each game ..."
79. Note that $P[E]+P[F]$ may be less than 1, i.e., $E \cup F$ do not necessarily contain all possible outcomes of a trial.

Theoretical Excercise Clarifications:
2. Assume $0 < P[A] < 1$.

Homework No. 3

Chapter 4: Do problems 2, 5, 6, 7, 8, 10, 11, 13, 17, 19, 20, 21, 23, 25, 27, 30b, 31, 38, 39, 42, 43, 44, 45, 49, 50, 51, 53, 56, 57, 58, 60, 61, 62, 66, 74, 75, 86
and theoretical excercises 2, 3, 6, 7, 8, 14, 15, 17, 19, 20, 28.

Problem Clarifications:
2. Only compute this up to $i = 10$.
42. The probability of doing at least this well is the probability of getting 7, 8, 9 or all 10 correct.
56. Assume exactly $n = 80000$ couples. Compute an approximate answer that is good when the number of couples n is large.
66. Make the reasonable assumption that the number of people that enter the casino between 12:00 and 12:05 is Poisson.
86. Find the expected number of accidents on the three highways combined.

Theoretical Excercise Clarifications:
2. Only consider $\alpha > 0$.

Homework No. 4

Chapter 5: Do problems 1, 2, 3, 4, 5, 6, 7, 8, 10a, 11, 15, 16, 17, 18, 19, 21, 31, 32, 33, 34, 35, 38, 39, 40, 41, 42, 43, 44
and theoretical excercises 1, 5, 7, 8, 9, 11, 13, 14, 26, 27, 29, 31.

Problem Clarifications:
21. Recall that there are 12 inches in a foot.
33. Use the natural logarithm ln instead of log.
40. Use the natural logarithm ln instead of log.

Theoretical Excercise Clarifications:

11. Assume that $\lim_{z\to\infty} g(z)e^{-z^2/2} = 0$ and $\lim_{z\to-\infty} g(z)e^{-z^2/2} = 0$.

26. To clarify, F is the cdf. Also assume that $F()$ is strictly increasing.

27. Assume $b > a > 0$.

Homework No. 5

Chapter 6: Do problems 6, 8ab, 9, 10, 15, 17, 18, 19, 20, 22, 23, 24, 26, 27, 28, 29a, 30, 32, 33, 34, 37, 41, 42, 44, 45, 46, 48, 52, 59, 60, 62
and theoretical excercises 1, 2, 5, 6, 9, 11, 14, 18, 19, 20, 37, 40, 41ab.

Problem Clarifications:

6. a) Find the marginal pmfs for X and Y.

17. Assume the three points are drawn iid.

26. For b), only show that the probabilty is $P[B^2 \geq 4AC]$. You can then solve the rest of part b) once we have covered Section 7.5.3 of the texbook. You may use $\int x^2 \ln x \, dx = \frac{x^3}{3}\ln x - \frac{x^3}{9}$ to solve this part as well.

29. Assume that the gross daily sales in different days are iid.

37. Assume that each page has the same number of words

42. b) Find the conditional pmf for X given $Y = j$ for $j = 1, 2, 3, 4, 5$.

46. Find $F_{Y|X}(y|x)$.

Theoretical Excercise Clarifications:

5. Don't do the special case of exponential random variables.

19. While this can be solved using lots of integration, take a step back and use much simpler symmetry arguments.

37. b) Assume that $a > 0$ and $c > 0$.

Homework No. 6

Chapter 7: Do problems 1, 4, 5, 6, 7, 9, 10, 16, 21, 26, 30, 31, 33, 37, 40, 41, 42, 47, 50ab, 52, 53, 55, 58, 60, 64acd, 65, 70, 73, 80, 81, 82, 84
and theoretical excercises 1, 2, 18, 20, 21, 23, 30, 54

Problem Clarifications:

10. Do *not* assume that the trials are necessarily independent.

82. a) Hint: Find the marginal distribution for Y and the conditional distribution for X given $Y = y$. Then use conditional expectations to compute the joint MGF.

84. First explain why $Z = X + Y$ is normal.

Theoretical Excercise Clarifications:

2. Hint: expand $E[|X - a|]$ as two integrals and use Leibniz's rule to take derivatives with respect to a.

23. Note that $\sqrt{x}$ should always be non-negative. So, in general $\sqrt{b^2} = |b|$.

Homework No. 7

Chapter 8: Do problems 1, 2, 3, 4, 5, 10, 14
and theoretical excercises 1