

STA 256f18 Assignment Five¹

Please read Sections 2.2 and 2.3 in Chapter 2 of the textbook and look over your lecture notes. These homework problems are not to be handed in. They are preparation for Term Test 2 and the final exam. All textbook problems are from Chapter Two. Use the formula sheet to do the problems. You will have a copy of Table 2 from Appendix B in the text. On tests and the final exam, you may use anything on the formula sheet unless you are being directly asked to prove it.

1. Do problem 33 in the text. The criteria for $F(x)$ being a cumulative distribution function is at the bottom of p. 36.
2. Do problem 34 in the text. For $f(x)$ to be a density, it must be non-negative and integrate to one. The first quartile is that point q_1 such that $P(X \leq q_1) = \frac{1}{4}$. The third quartile is that point q_3 such that $P(X \leq q_3) = \frac{3}{4}$. The second quartile is the median.
3. For the distribution of problem 34 in the text, give
 - (a) $F(-2)$ [Answer: 0]
 - (b) $F(-1)$ [Answer: 0]
 - (c) $F(0)$ [Answer: $\frac{1}{2} - \frac{\alpha}{4}$]
 - (d) $F(1)$ [Answer: 1]
 - (e) $F(2)$ [Answer: 1]
4. Do problem 38 in the text.
5. Do problem 39 in the text. “Recall” that $\frac{d}{dx} \tan^{-1}(x) = \frac{1}{1+x^2}$. The Cauchy distribution is the problem child of Statistics. Frequently, results that seem to be true in general are not true for the Cauchy. Thus it is useful because it helps us recognize the limitations of our knowledge.
6. Do problem 40 in the text.
7. Do problem 35 in the text.
8. Do problem 37 in the text.
9. Do problem 41 in the text.
10. Do problem 44 in the text. Also show that the probabilities sum to one.
11. Do problem 45 in the text.

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12. If X is an exponential random variable, prove $P(X > t + s | X > s) = P(X > t)$, where $t > 0$ and $s > 0$.
13. Do problem 48 in the text.
14. Let $X \sim N(\mu, \sigma)$ and $Z = \frac{X - \mu}{\sigma}$. Find the density of Z .
15. Do problem 52 in the text. There are 12 inches in a foot and 2.54 centimeters in an inch. Use Table 2 from Appendix B in the text for part (a).
16. Do problem 53 in the text. Use the table.
17. Do problem 54 in the text. Use the table.
18. Do problem 55 in the text. Use the table.
19. Do problem 56 in the text.
20. Do problem 57 in the text.
21. Do problem 61 in the text.
22. Do problem 62 in the text.
23. Do problem 62 in the text.
24. Do problem 68 in the text.
25. Let the continuous random variable X have distribution function $F_x(x)$, and let $Y = F_x(X)$.
 - (a) For what values of y is $f_y(y) > 0$?
 - (b) Find $f_y(y)$. Do you recognize this distribution?
26. Let the continuous random variable X have cumulative distribution function $F_x(x)$ and density $f_x(x)$. The distribution function is strictly increasing on a single interval (which could be infinite), so that the inverse function $F_x^{-1}(y)$ is defined in the natural way. Let $Y = F_x^{-1}(U)$, where U is a uniform random variable on the interval from zero to one. Find the cumulative distribution function and density of Y .

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<http://www.utstat.toronto.edu/~brunner/oldclass/256f18>