Worksheet 8: Special continuous distributions

Example 0.68. Suppose a bus arrives at a stop uniformly random between noon and 12:15pm, and you arrive at the bus stop exactly at noon. What is the probability that you will wait (1) no more than 5 minutes or (2) between 5 and 10 minutes, or (3) more than 10 minutes?

Example 0.69. Suppose $Z \sim N(0, 1)$. Find

- $P(Z < 0) =$
- $P(Z < -1.3) =$
- $P(Z > 1.3) =$
- $P(-2.5 < Z < 1.5) =$
- $P(-1 < Z < 1) =$
- $P(-2 < Z < 2) =$
- $P(-3 < Z < 3) =$

Example 0.70. Find the 25th (first quartile), 50th (median), 75th (their quartile) percentiles of $Z \sim N(0, 1)$.

Example 0.71. Find z_α for $\alpha = .01, .05, .1$

Example 0.72. Suppose $X \sim N(5, 3^2)$. Verify that $P(X > 4.1) = 0.6179$, $P(X < -1) = 0.0228$ and $P(2 < X < 5.3) = 0.3812$.

Example 0.73. Suppose $X \sim N(5, 3^2)$. Find the 90th percentile.

Example 0.74. Use normal approximation to find the probability of getting exactly 22 heads when tossing a fair coin 40 times (answer: Binomial 0.1031, Normal 0.1030). What about no more than 22 heads (answer: Binomial 0.7852, Normal approximation 0.7364, and Normal+continuity correction 0.7854)?

Example 0.75. Suppose the life time of a certain brand of light bulbs is exponentially distributed with an average of $1,000$ hours. What is the probability that a new light bulb can exceed this amount of time? What about lasting between $1,000$ and $2,000$ hours?

Example 0.76. Jones figures that the total number of thousands of miles an auto can be driven before it would need to be junked is an exponential random variable with parameter $\lambda = 1/20$. Smith has a used car that he claims has been driven only 10,000 miles. If Jones purchases the car, what is the probability that she would get at least 20,000 additional miles out of it? Repeat under the assumption that the lifetime mileage of the car is not exponentially distributed but rather is (in thousands of miles) uniformly distributed over (0, 40).