Answers to Exercises

Section 4.4　56，67，70

Section 4.6　87,　86

Section 4-4

59.

a. $E(X) = \dfrac{1}{\lambda} = 1$.

b. $\sigma = \dfrac{1}{\lambda} = 1$.

c. $P(X \le 4) = 1 - e^{-(1)(4)} = 1 - e^{-4} = .982$.

d. $P(2 \le X \le 5) = (1 - e^{-(1)(5)}) - (1 - e^{-(1)(2)}) = e^{-2} - e^{-5} = .129$.

67. Notice that $\mu = 24$ and $\sigma^2 = 144 \Rightarrow \alpha\beta = 24$ and $\alpha\beta^2 = 144 \Rightarrow \beta = \dfrac{144}{24} = 6$ and $\alpha = \dfrac{24}{\beta} = 4$.

a. $P(12 \le X \le 24) = F(4; 4) - F(2; 4) = .424$.

b. $P(X \le 24) = F(4; 4) = .567$, so while the mean is 24, the median is <u>less</u> than 24, since $P(X \le \tilde{\mu}) = .5$. This is a result of the positive skew of the gamma distribution.

c. We want a value x for which $F\left(\dfrac{x}{\beta}, \alpha\right) = F\left(\dfrac{x}{6}, 4\right) = .99$. In Table A.4, we see $F(10; 4) = .990$. So $x/6 = 10$, and the 99th percentile is $6(10) = 60$.

d. We want a value t for which $P(X > t) = .005$, i.e. $P(X \le t) = .005$. The left-hand side is the cdf of X, so we really want $F\left(\dfrac{t}{6}, 4\right) = .995$. In Table A.4, $F(11; 4) = .995$, so $t/6 = 11$ and $t = 6(11) = 66$. At 66 weeks, only .5% of all transistors would still be operating.

70. To find the (100p)th percentile, set $F(x) = p$ and solve for x: $p = F(x) = 1 - e^{-\lambda x} \Rightarrow e^{-\lambda x} = 1 - p \Rightarrow$
$-\lambda x = \ln(1-p) \Rightarrow x = -\dfrac{\ln(1-p)}{\lambda}$.

To find the median, set $p = .5$ to get $\tilde{\mu} = -\dfrac{\ln(1-.5)}{\lambda} = \dfrac{.693}{\lambda}$.

Section 4-6

87. The given probability plot is quite linear, and thus it is quite plausible that the tension distribution is normal.

88. The data values and z percentiles provided result in the probability plot below. The plot shows some non-trivial departures from linearity, especially in the lower tail of the distribution. This indicates a normal distribution might not be a good fit to the population distribution of clubhead velocities for female golfers.