1. **Solution of 6.10 pp287:**

(a) Let \( C = \{(x, y) \in \mathbb{R}^2, \ x < y \} \). Hence,

\[
P(X < Y) = P((X, Y) \in C)
\]

\[
= \int \int_C f(x, y)dx\,dy
\]

\[
= \int_0^\infty \int_0^y e^{-(x+y)}dx\,dy
\]

\[
= \int_0^\infty e^{-y} \left( \int_0^y e^{-x}dx \right) \,dy
\]

\[
= \int_0^\infty e^{-y} \left( -e^{-y} \right) \,dy
\]

\[
= \int_0^\infty e^{-y} \left( 1 - e^{-y} \right) \,dy
\]

\[
= -e^{-y} + \frac{1}{2}e^{-2y} \big|_0^\infty = 1 - 1/2 = 1/2.
\]

(b) First, we have to compute the marginal density function of \( X \). For \( x > 0 \)

\[
f_X(x) = \int_{-\infty}^{\infty} f(x, y)dy
\]

\[
= \int_0^\infty e^{-(x+y)}dy
\]

\[
= e^{-x}
\]

Hence,

\[
P(X < a) = \int_{\inf \, t}^{a} f_X(x)\,dx
\]

\[
= \int_0^a e^{-x}dx
\]

\[
= -e^{-x} \big|_0^a
\]

\[
= 1 - e^{-a}.
\]

2. **Solution of 6.11 pp 287:**

Let us denote by \( O \) an ordinary TV purchaser, by \( M \) a plasma TV purchaser and by \( B \) a customer browsing. then, we have the following probabilities \( P(O) = 0.45 \), \( P(M) = 0.15 \) and \( P(B) = 0.4 \). Let us denote by \( X_o \) the number of ordinary TV
purchasers, by $X_p$ the number of plasma TV purchasers and by $X_b$ the number of customers browsing, then we have to compute $P(X_o = 2, X_p = 1, X_b = 2)$ using the fact that these events are independent we get that

$$P(X_o = 2, X_p = 1, X_b = 2) = \frac{5!}{2!1!2!} P(O)^2 P(M) P(B)^2$$

$$\frac{5!}{2!1!2!} (0.45)^2 (0.15)(0.40)^2.$$

3. **Solution of 6.40 pp287:**
   Done in class.