1. Consider one-dimensional Brownian motion with no drift, an absorbing barrier at zero, and $c = 3\ \frac{\text{cm}^2}{\text{sec}}$, starting at $X(0) = 4$ cm. Calculate the probability of:

   (a) the process getting absorbed within the first 15 seconds,

   (b) $10\text{ cm } < X(15\text{ sec.}) < 20\text{ cm}$.

2. Assuming a Brownian motion with $c = 13.8\frac{\text{cm}^2}{\text{hr.}}$ and $d = 0$ (no absorbing barrier), find:

   (a) $\Pr\{X(3\text{ hours}) > -4\text{ cm} \,|\, X(0) = 1\text{ cm}\}$,

   (b) $\Pr\{X(24\text{ hours}\} > 15\text{ cm } \cap \min_{0< t <1\,\text{day}} X(t) > 0 \,|\, X(0) = 3\text{ cm}\}$,

   (c) $\Pr\{\max_{0< t <1\,\text{day}} X(t) > 15\text{ cm} \,|\, X(0) = 0\}$.

3. Consider a Brownian motion with a drift of $-5.2\frac{\text{mm}}{\text{hr}}$ and a diffusion coefficient of $7.3\frac{\text{mm}^2}{\text{hr}}$. Evaluate:

   (a) $\Pr\{X(10{:}13) < 26\,\text{mm} \,|\, X(9{:}31) = 30\,\text{mm}\}$

   (b) $\Pr\{X(10{:}13) < 26\,\text{mm} \,|\, X(9{:}31) = 30\,\text{mm} \cap X(10{:}42) = 27\,\text{mm}\}$