(1) Two balls are withdrawn randomly without replacement from a bowl containing 3 white and 3 black balls. Let $X$ be the number of white balls among the withdrawn balls. What are the probability mass function of $X$, $\mathbb{E}X$ and $\text{Var}(X)$?

Please write your answer here:

\[
\text{p.m.f.:

[\mathbb{E}X = ]

[\text{Var}(X) = ]
\]

Please go to the next page ...
(2) Suppose that earthquakes occur on the West coast of the U.S. on average at a rate of 3 per week (including very mild ones) and follow Poisson probability distribution. What is the probability that there will be 2 earthquakes next week, if we suppose that at least one will happen? (Hint: use conditional probability).

Please write your answer here:

\[ P(X = 2|X \geq 1) = \]

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(3) Suppose $X$ is exponentially distributed with the mean $\mathbb{E}X = 2$. What is the probability $3 < X < 5$ if we know that $X > 2$? (Hint: use conditional probability and the basic properties of the exponentially distribution).

Please write your answer here:

$P(3 < X < 5|X > 2) =$
(4) Suppose $X = \mathcal{N}(\mu, \sigma^2)$, $P(X < 0) = 0.15866 = \Phi(-1)$ and $P(X < 5) = 0.97725 = \Phi(2)$. Find $\mu$ and $\sigma$.

Please write your answer here:

$\mu =$

$\sigma =$

Please go to the next page ...
(5) Suppose we toss a fair coin 16 times. Find the formula for the best possible normal approximation of the probability that there are at least 9 heads. You do not have to evaluate the numeral value but your answer should include $\Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-y^2/2} dy = \mathbb{P}(Z < x)$, where $Z$ is the standard normal random variable.

Please write your answer here:

$P(X \geq 9) \approx$
(6) Suppose the random variable $X$ is uniformly distributed in the interval $[0, 2]$ and $Y = X^3$. Find the c.d.f. $F_Y(y)$ and $EY$.

Please write your answer here:

$$F_Y(y) =$$

$$EY =$$