Problem 1

The monthly worldwide average number of airline crashes is 3.5. What is the probability that there will be
(a) at least two airline crashes in the next month?
(b) at most one crash in the next year?

Problem 2

The suicide rate in a certain state is 1 suicide per 100,000 inhabitants per month.

(a) What is the probability that in a city of 400,000 there will be 8 or more suicides in a given month?
(b) What is the probability that there will be at least 2 months during the year in which there are 8 or more suicides in this city of 400,000?
(c) Counting the current month as month number 1, what is the probability that the first month to have 8 or more suicides in this city of 400,000 is month will be month number i, where i = 1, 2, 3, ...?

Problem 3

The following table displays the CDF of random variable X. What is the PMF of X?

<table>
<thead>
<tr>
<th>$F(b)$</th>
<th>$b$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>$b &lt; 0$</td>
</tr>
<tr>
<td>0.5</td>
<td>$0 \leq b &lt; 1$</td>
</tr>
<tr>
<td>0.6</td>
<td>$1 \leq b &lt; 2$</td>
</tr>
<tr>
<td>0.8</td>
<td>$2 \leq b &lt; 3$</td>
</tr>
<tr>
<td>0.9</td>
<td>$3 \leq b &lt; 3.5$</td>
</tr>
<tr>
<td>1</td>
<td>$b \geq 3.5$</td>
</tr>
</tbody>
</table>

Problem 4

Let $X$ be a continuous random variable taking values on the interval 0 to 3, with density $f(x)$ as shown below.
The diagram shows a linear function $f(x)$ with a slope of $k$ and a y-intercept at $3$. The function's graph goes through the point $(3, f(x))$. The diagram illustrates the relationship between the input $x$ and the output $f(x)$.
(a) What value must \( k \) have in order for \( f(x) \) to be a valid probability density function?

(b) What is the probability that \( X > 1 \)?

(c) What are the expected value and variance of \( X \)?

**Problem 5**

You arrive at a bus stop at 10:00. You know that the bus will arrive sometime between 10:00 and 10:30, and you believe that the arrival time is distributed uniformly in this interval.

(a) What is the probability you have to wait more than 10 minutes?

(b) If at 10:15, the bus has still not arrived, what is the probability that you have to wait at least 10 minutes more?

**Problem 6**

If \( X \) is uniformly distributed on \((-1, 1)\), find its probability density function, its mean and its variance.