Problem 1

a) Find $H$ in $f(x, y) = H \left[ (1 - \frac{x}{12}) - \frac{y}{3} \right]_{xy}

\text{Normalization} \quad 1 = \int_{0}^{12} \int_{0}^{3} (1 - \frac{x}{12}) \, f_{xy}(x, y) \, dy \, dx

\Rightarrow H = \frac{1}{6}

b) Find $\text{Prob}(y > 2 \mid x < 6) = \frac{\text{Prob}(y > 2, x < 6)}{\text{Prob}(x < 6)}$

$\text{Prob}(y > 2, x < 6) = \int_{0}^{4} \int_{2}^{3} (1 - \frac{x}{12}) \, f_{xy}(x, y) \, dy \, dx = 0.038

* Note that upper limit of integration of $x$ is 4, not 6, because the domain of $y > 2$ does not extend beyond $x = 4$, or $f_{xy}(x, y) (x > 4, y > 2) = 0$. 
Releases during transportation over distance, $l$.

$$E(x|l) = \int_0^l x f(x|l) \, dx$$

$$= \int_0^l x \gamma \left( \frac{l}{l_0} \right) e^{-\gamma \left( \frac{x}{l_0} \right)} \, dx$$

$$= \frac{1}{\delta} \left( \frac{l}{l_0} \right).$$

$$E(x) = \sum_{i=1}^{2} E(x|l_i) \text{Prob}(l_i)$$

$$= \frac{1}{\gamma l_0} \left[ \frac{1}{4} l_1 + \frac{3}{4} l_2 \right] = 8.125 \text{Ci}$$

Results

<table>
<thead>
<tr>
<th>Policy</th>
<th>Releases During Storage</th>
<th>Releases During Transportation</th>
<th>Total Releases</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 NPP-Site Storage</td>
<td>10</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>2 Central Repository Storage</td>
<td>8.25</td>
<td>9.25*</td>
<td></td>
</tr>
</tbody>
</table>

* = Preferred policy.
\[ \text{Prob. } (x < 6) = \int_0^6 \int_0^{3(1-x/2)} f_{xy}(x,y) \, dy \, dx = \frac{7}{8} \]

\[ \therefore \text{Prob. } (y > 2 \mid x < 6) = \frac{0.038}{(7/8)} = 0.043 \]

**Problem 2**

Is it better to store spent fuel rods at the reactor sites or at a central repository? Compare expected radioactive releases via each policy, and select policy resulting in the lower expected release, \( E(x) \), magnitude.

\[ E(x) = E(x_i) \]

During Storage for 100 years.

During Transport (at earliest possible date)

Releases during storage:

\[ E(x) = \sum_{i=1}^{10^{-2}} \left( \begin{array}{c} \text{units for nuclear power plant storage} = 10^{-1} \\ \text{units for central repository storage} = 10^{-2} \end{array} \right) \]