4. [7 points] Some of Flora’s friends are hurt while the intruders are building the settlement. Flora and Nile are trying their best to heal them. Suppose $p(x)$ is the probability density function for the number of weeks, $x$, it takes for everyone to recover after intruders appear.

\[
p(x) = \begin{cases} 
  c & \text{if } 0 < x \leq 1, \\
  2c & \text{if } 1 < x \leq 3, \\
  0 & \text{else.}
\end{cases}
\]

a. [2 points] Find $c$.

b. [5 points] Let $W(x)$ be the cumulative distribution function for $p(x)$. Showing your work, give a piece-wise defined formula for $W(x)$ in the form given below.

\[
W(x) = \begin{cases} 
  \text{expression} & \text{if } x \leq 0, \\
  \text{expression} & \text{if } 0 < x \leq 1, \\
  \text{expression} & \text{if } 1 < x \leq 3, \\
  \text{expression} & \text{if } x > 3.
\end{cases}
\]

5. [12 points] Another function $f(t)$ given by

\[
f(t) = \begin{cases} 
  \frac{t}{6} & \text{if } 0 < t \leq 2, \\
  \frac{1}{3} & \text{if } 2 < t \leq 4, \\
  0 & \text{else.}
\end{cases}
\]

is the probability density function for the number of months $t$ that it will take the intruders to build the settlement.

a. [3 points] Find the probability that it will take the intruders between 1 and 2 months to build the settlement.

b. [5 points] Find the mean number of months it will take the intruders to build the settlement.

c. [4 points] Find the median number of months it will take the intruders to build the settlement.