Probability: Homework 2

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Problem 1:

(1): By definition, a probability mass function must satisify $\sum^t f(t) = 1$, if $x \in \{0, 1, 2\}$

$$\text{then } \sum_{i=0}^{2} \frac{k}{2^x} = 1$$
$$\frac{k}{2^0} + \frac{k}{2^1} + \frac{k}{2^2} = 1$$
$$\frac{k}{1} + \frac{k}{2} + \frac{k}{4} = 1$$
$$\frac{4k}{4} + \frac{2k}{4} + \frac{k}{4} = 1$$
$$\frac{7}{4}k = 1$$
$$k = 0.5714$$

(2):

Problem 2:

(1): For $f(t)$ to be a pdf, $\int_{-\infty}^{\infty} f(t)dt = 1$

$$\int_0^\infty ce^{-2t}dt = 1$$
$$c\int_0^\infty e^{-2t}dt = 1$$
$$c\int_0^\infty e^u - \frac{1}{2}du = 1$$
$$c\int_0^\infty \frac{-e^u}{2}du = 1$$
$$\frac{-c}{2}\int_0^\infty e^u du = 1$$
$$\Big[-\frac{1}{2}ce^{-2t} \Big]_0^\infty = 1$$
$$\lim_{t\to\infty} (-\frac{1}{2}ce^{-2t}) - (-\frac{1}{2}c) = 1$$
$$0 + \frac{1}{2}c = 1$$
$$c = 2$$