1. (16 points)

(a) If $\int_0^1 f(x)\,dx = 2$, then $\int_0^2 f\left(\frac{x}{2}\right)\,dx =$ _____.

(b) Does the infinite series $\sum_{n=1}^{\infty} \frac{2^n}{n!}$ converge or diverge? *Justify your answer.*

(c) Is the function te^{-2t} a solution of the differential equation $\frac{dy}{dt} + 2y - e^{-2t} = 0$? *Explain why or why not.*

(d) Suppose $C(t)$ is the daily cost of heating your house, measured in dollars per day, where $t = 0$ corresponds to January 1, 2004. Give the meaning, in words, of each of the following quantities.

(i) $\int_0^{60} C(t)\,dt\,.$

(ii) $\frac{1}{60}\int_0^{60} C(t)\,dt\,.$