1 (a) $\int_1^2 .5e^{-.5x}dx = -e^{-.5x}\Big|_{x=1}^{2} = \frac{1}{\sqrt{e}} - \frac{1}{e} \approx .23865 \approx 24\%$

(b) $\int_0^1 .5e^{-.5x}dx = -e^{-.5x}\Big|_{x=0}^{1} = 1 - \frac{1}{\sqrt{e}} \approx .39347 \approx 39\%$

(c) $\int_3^\infty .5e^{-.5x}dx = -e^{-.5x}\Big|_3^\infty = \frac{1}{e^{3/2}} \approx .22313 \approx 22\%$

(d) $F(x) = \int_0^x .5e^{-.5t}dt = -e^{-.5t}\Big|_{t=0}^{x} = \boxed{1-e^{-.5x}}$.

2 $\mu = \int_0^\infty .5xe^{-.5x}dx = -xe^{-.5x}\Big|_{x=0}^{\infty} + \int_0^\infty e^{-.5x}dx$

$= \frac{-1}{.5}e^{-.5x}\Big|_{x=0}^{\infty} = \boxed{2 \text{ minutes}}$. ← mean

[median] = M, where $\int_0^M .5e^{-.5x}dx = \frac{1}{2}$.

That is, $-e^{-.5x}\Big|_{x=0}^{M} = \frac{1}{2} \Leftrightarrow 1 - e^{-.5M} = 1/2$

$\Leftrightarrow e^{-.5M} = \frac{1}{2} \Leftrightarrow -.5M = \ln(\frac{1}{2}) \Leftrightarrow$

$M = -\frac{1}{.5}\ln(1/2) = 2\ln 2 \approx 1.386$ min.

3 (a) $.6+.06+\cdots = \sum_{n=0}^{\infty} .6(10^{-n}) = .6\sum_{n=0}^{\infty} 10^{-n} = .6\left(\frac{1}{1-\frac{1}{10}}\right)$

$= \frac{6}{10}\left(\frac{10}{9}\right) = \frac{6}{9} = \boxed{\frac{2}{3}}$.

(b) $.1+.01+\cdots = (.1)\sum_{n=0}^{\infty} 10^{-n} = \frac{1}{10}\left(\frac{1}{1-\frac{1}{10}}\right) = \frac{1}{10}\left(\frac{10}{9}\right) = \boxed{\frac{1}{9}}$

4 (a) We use the ratio test: $\left|\frac{a_{n+1}}{a_n}\right| = \frac{(n+1)\,2^{-(n+1)}}{n\;2^{-n}} = \left(\frac{n+1}{n}\right)\cdot\frac{1}{2}$

$\to \frac{1}{2} < 1$ as $n \to \infty$. Thus, the series converges absolutely.

(b) Again, we use the ratio test:

$$\frac{\frac{(n+1)!}{(2(n+1))!}}{\frac{n!}{(2n)!}} = \frac{(n+1)(\cancel{n!})(\cancel{2n!})}{(2n+2)(2n+1)\cancel{(2n)!}\,(\cancel{n!})}$$

$$= \frac{(n+1)}{(2n+2)(2n+1)} \to 0 < 1 \text{ as } n \to \infty.$$ Thus, the series converges absolutely.

(c) The series is an alternating series, and $\frac{1}{\ln(n)}$ decreases monotonically to zero, so, by the alternating series test, the series converges. However,

$\frac{1}{\ln(n)} \geq \frac{1}{n}$ and $\sum_{n=2}^{\infty} \frac{1}{n}$ diverges, so $\sum_{n=2} (-1)^{n-1} \frac{1}{\ln(n)}$

does not converge absolutely; that is,

$\sum_{n=2}^{\infty} (-1)^{n-1}\left(\frac{1}{\ln(n)}\right)$ only converges conditionally.