1. (8 pts) Evaluate the integral.

(a) $\displaystyle\int xe^{-x}dx$

(b)* $\displaystyle\int \frac{\ln x}{\sqrt{x}}dx$

(c) $\displaystyle\int_0^{\pi/2} x^2 \cos x\, dx$

2. (12 pts) Find the limit. Use L'Hospital's Rule where appropriate.

(a) $\lim\limits_{x \to 0} \dfrac{x - \ln(1 + x)}{x^2}$

(b)* $\lim\limits_{x \to 0^+} x(\ln x)^2$

(c) $\lim\limits_{x \to \frac{\pi}{2}} (\tan x - \sec x)$

(d) $\lim\limits_{x \to \infty} x^{\frac{1}{\ln x}}$