# Phys 129L, Section 6A

Task 1: $V = \frac{4}{3}\pi R^3$, mean: $\lambda = nV$

$P(\text{No stars in } V) = e^{-n\cdot\frac{4}{3}\pi R^3}$

CDF: $F(R) = 1 - P(\text{No stars}) = 1 - e^{-n\cdot\frac{4}{3}\pi R^3}$

PDF: $f(R) = \frac{dF(R)}{dR} = \boxed{4\pi n R^2 e^{-n\cdot\frac{4}{3}\pi R^3}}$

Task 2: $\frac{d^2x}{dt^2} + \gamma\frac{dx}{dt} + \omega_0^2 x = Fe^{i\omega_f t}$

$-\omega^2\tilde{x} + i\gamma\omega\tilde{x} + \omega_0^2\tilde{x} = F\delta(\omega-\omega_f)$

Fourier: $(-\omega^2 + i\gamma\omega + \omega_0^2)\tilde{x}(\omega) = F\delta(\omega-\omega_f)$

$\rightarrow \tilde{x}(\omega) = \frac{F\delta(\omega-\omega_f)}{-\omega^2 + i\gamma\omega + \omega_0^2} = \frac{F}{-\omega_f^2 + i\gamma\omega_f + \omega_0^2}\delta(\omega-\omega_f)$

$\rightarrow$ Inverse Fourier Transform:

$x(t) = \frac{Fe^{i\omega_f t}}{-\omega_f^2 + i\gamma\omega_f + \omega_0^2}$

Power absorbed: $P = \frac{1}{2}F\,\mathrm{Re}[x(t)e^{-i\omega_f t}]$

$= \frac{1}{2}F^2\,\mathrm{Re}\left[\frac{1}{-\omega_f^2 + i\gamma\omega_f + \omega_0^2}\right]$

$= \frac{1}{2}F^2\frac{\gamma\omega_f}{(\omega_0^2-\omega_f^2)^2 + \gamma^2\omega_f^2}$

$\rightarrow E = P\cdot T = P\cdot\frac{2\pi}{\omega_f} = \boxed{F\pi\frac{\gamma\omega_f}{(\omega_0^2-\omega_f^2)^2 + \gamma^2\omega_f^2}}$