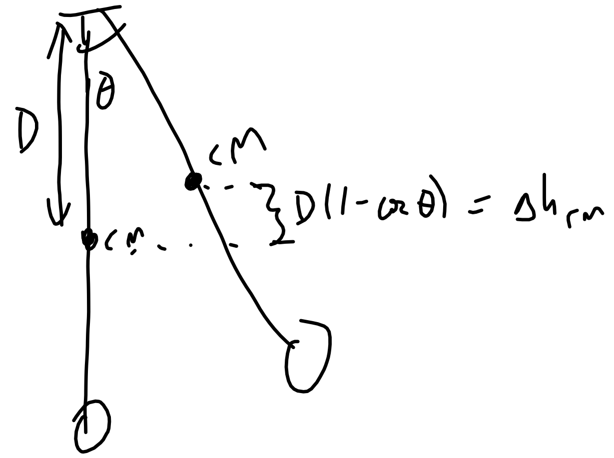
Nov 21.



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Problem from Chapter 15:

$$E = \frac{1}{2} k A^2$$

A is decreasing by 3% during each cycle

In one cycle, $E' = \frac{1}{2} k (.97A)^2$

$$\sim \frac{1}{2} k (.94) A^2$$

E' is 6% smaller than E

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Alternatively,

$$E = \frac{1}{2} k A^2$$

Take log of both sides

$$\ln E = \ln\left(\frac{1}{2} k A^2\right) = \ln\left(\frac{1}{2}\right) + \ln(k) + \ln(A^2)$$

$$= \ln\left(\frac{1}{2}\right) + \ln(k) + 2\ln(A)$$

Recall if $y = \ln x$

$$\frac{dy}{dx} = \frac{1}{x} \quad \text{or} \quad dy = \frac{dx}{x}$$

Now take deriv of both sides of log eq.

$$\boxed{\frac{dE}{E} = 2\frac{dA}{A}}$$

for $\frac{dA}{A} = 0.03$ (3%)

then $\frac{dE}{E} = .06$ (6%)

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$$y(x,t) = \underbrace{0.1}_{A} \sin(\underbrace{3}_{k}x + \underbrace{10}_{\omega}t)$$

$$k = \frac{2\pi}{\lambda} \Rightarrow \lambda = \frac{2\pi}{k} = \frac{2\pi}{3}$$

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