

A Heat Harmonic Hypothesized
(More Practice with SHO)

PHYSICS 204

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Imagine a newly discovered weather pattern in which the temperature, measured in Degrees Kelvin and designated D , fluctuates according to the following equation (for which time is measured in SECONDS):

$$\frac{d^2D}{dt^2} = -121D.$$

Imagine, further, some weather system for which the initial temperature is $D_0 = 300$ K.

- 1) In seconds, find how much TIME will elapse before the very next time the temperature returns to 300 C. You may round to something like 3 sig figs.
- 2) In Kelvins., Find the temperature at the moment precisely 200 seconds have elapsed (from the start). You may round to something like 3 sig figs.
- 3) In what units must the 121 be measured?
- 4) Meteorologists conjecture that this weather system can be modeled as a huge concentration of hot air, being pulled and pushed by pressure differentials that behave as though they were elastic bands.

Assume the hot air has a mass of 8×10^2 Kg.

If these pressure differentials are fluctuating as though they were elastic, then their *effective elasticity* can be quantified as a *stiffness*, i.e.: *spring constant*. Find the *STIFFNESS* of this representational weather *spring*.

- 5) TRUE or FALSE: $D = 300 \cos(11t)$ is one possible "SOLUTION" to the Dif. Equation provided at the top of this sheet.
- 6) TRUE or FALSE:
 $D = 99 \cos(121t)$ is one possible "SOLUTION" to that (same) Dif. Equation provided at the top of this sheet.
- 7) TRUE or FALSE: $D = 300(\cos 11t + 273)$
that (very same) Dif. Equation provided at the top of this sheet.