

Quiz 7/8

Names: _____

1. When you rise from a chair, you have to lean quite far forward (try it!). Why is this?

2. By experiment you've determined the spring constant for the springs on each wheel of a car. You use Hooke's Law, $F = -kx$, to model these springs. Which factor(s) of Hooke's Law F , k or x would the following physical features fit – or would it not fit the model provided by Hooke?
 - a. Load of groceries in the car.
 - b. Thickness of metal used to make the springs.
 - c. Car sinking down when a very large man (400 lbs) enters the car.
 - d. Pressure in the tires of the car.

3. Two bears are hanging out on a tree branch as shown. Let's guess that each bear's mass is 40 kg and the tree branch is 50 kg and is 5 meters long. Assume one bear is about 1 meter from the trunk and the other is 2.5 meters from the trunk.



- a. Determine the net torque on the branch where it meets the trunk of the tree. Model the branch as if it's growing perfectly horizontal to the ground.
- b. Now determine the torque at the trunk if these two bears moved to identical locations on a higher branch that was growing upward at an angle of 25° .



$$\theta_f = \theta_i + \omega_i \Delta t + \frac{1}{2} \alpha (\Delta t)^2$$

$$\omega_f = \omega_i + \alpha \Delta t$$

$$\omega_f^2 = \omega_i^2 + 2\alpha (\Delta \theta)$$

$$\tau = F_{\perp} r$$

$$v = \omega r$$

$$a_c = \frac{v^2}{r} = \omega^2 r$$

$$x_{cg} = \frac{x_1 m_1 + x_2 m_2 + x_3 m_3 + \dots}{m_1 + m_2 + m_3 + \dots}$$

$$F_{sp} = -k \Delta x$$

$$\frac{F}{A} = Y \frac{\Delta L}{L}$$