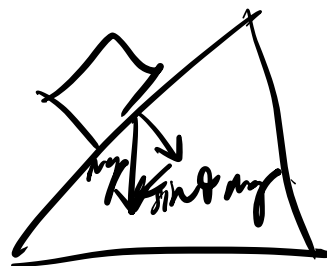


Spring into ramp problem

We want to find the velocity of the box as it leaves the spring.
We know that the KE as it leaves is equal to the PE.

$$\begin{aligned} PE_i &= KE_f \\ \frac{1}{2} kx^2 &= \frac{1}{2} mv^2 \\ \sqrt{\frac{kx^2}{m}} &= v \end{aligned}$$



Now we have the velocity of box as it goes up the ramp.
Immediately, gravity acts on it, causing it to decelerate.
How much?

$$\Sigma F = ma$$

$$\sin \theta \, mg = ma$$

$$\sin \theta \, g = a$$

Now we know how fast it's slowing down

$$v_f^2 = v_i^2 + 2ax$$

$$0 = \left(\frac{kx^2}{m} \right) + 2(\sin\theta)x$$

$$-\frac{kx^2}{m} = -2\sin\theta x$$

$$+\frac{kx^2}{m \cdot 2\sin\theta} = x$$