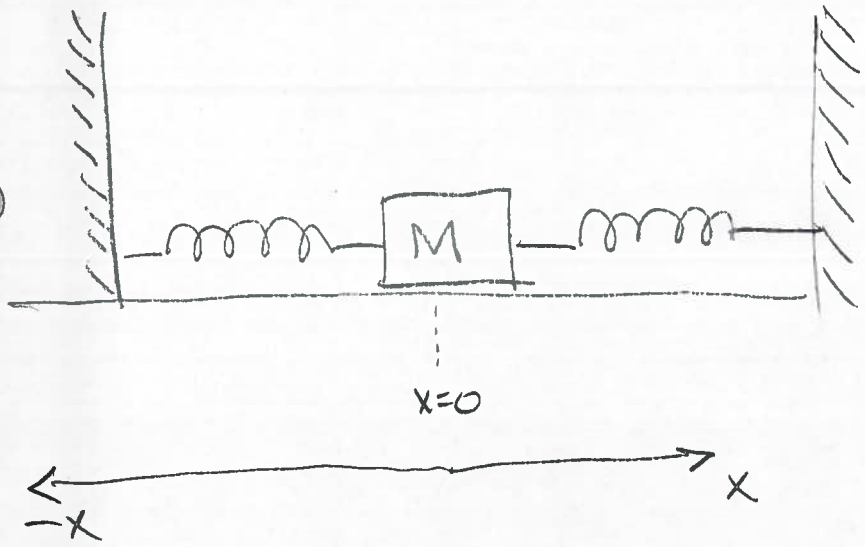

Block of mass M on frictionless floor. Springs of force const k at rest when block at x=0.

a) If displace block by dist $\vec{x}$ to right, then

$$\vec{F}_{net} = \underbrace{-k\vec{x}}_{\text{left spring}} + \underbrace{-k\vec{x}}_{\text{right spring}} = \underbrace{-2k\vec{x}}_{\text{total}}$$

$$\boxed{\vec{F}_{net} = -2kx\ \hat{\imath}}$$ force to left

b) In this case,

$$m\vec{a} = -2k\vec{x}$$

$$m\frac{d^2\vec{x}}{dt^2} = -2k\vec{x}$$

$$\frac{d^2\vec{x}}{dt^2} = -\left(2\frac{k}{m}\right)\vec{x}$$

$$\rightarrow \quad \omega = \sqrt{\frac{2k}{m}} \quad \rightarrow \quad T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{M}{2K}}$$

c) Joe chooses $M = 1.5\ kg$

$k = 10 \frac{N}{m}$ each spring

He displaces block by $\vec{x} = 0.2\ m$ to left of rest, then releases it at $t = 0$.

Position of block will be

$$x(t) = (-0.2\ m)\cos\left(\sqrt{\frac{2k}{M}}\,t\right)$$

$$\boxed{x(t) = (-0.2\ m)\cos\left(3.65 \frac{rad}{s}\,t\right)}$$

d) Max speed of block? First, find $v(t)$ for any time.

$$v(t) = \frac{dx}{dt} = -\left(3.65 \frac{rad}{s}\right)(-0.2\ m)\sin\left(3.65 \frac{rad}{s} \cdot t\right)$$

$$= \left(0.73 \frac{m}{s}\right)\sin\left(3.65 \frac{rad}{s} \cdot t\right)$$

↑

max speed is when cosine term is ± 1

→ $\boxed{0.73 \frac{m}{s}}$