What are actions?

using
grav. potential

integral of motion

radial action

momentum p_R

position R

see e.g.
Sanders & Binney (2016)

$$J_R$$
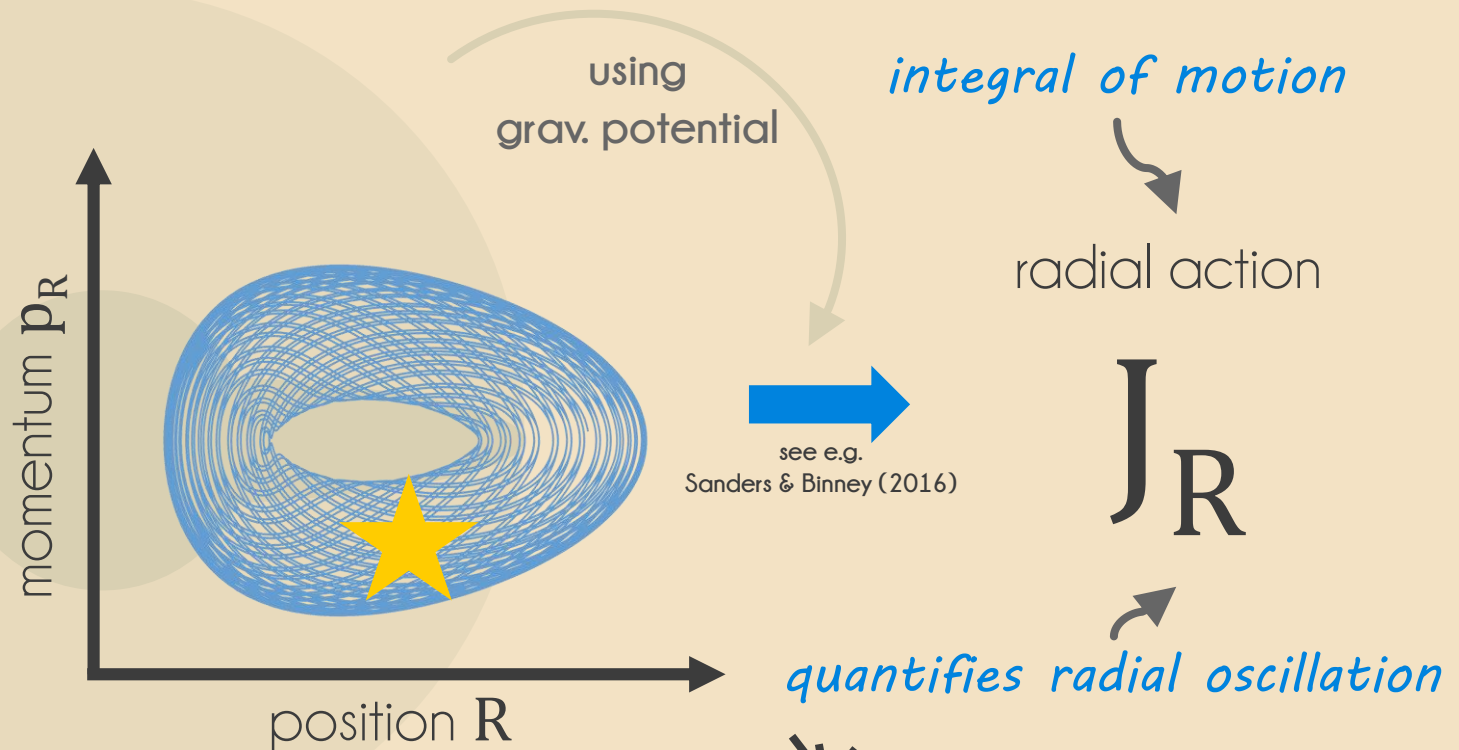
quantifies radial oscillation

Actions are
excellent
orbit labels.

... analogous for
- vertical action J_z
- azimuthal action $J_\varphi = L_z$
(angular momentum)

with angles $\vec{\theta}$:
canonical coordinates