9-4) Stability and balance

an object in static equillibrium if its left undisturped will undergo no transational or rotational acceleration

↓ ↓

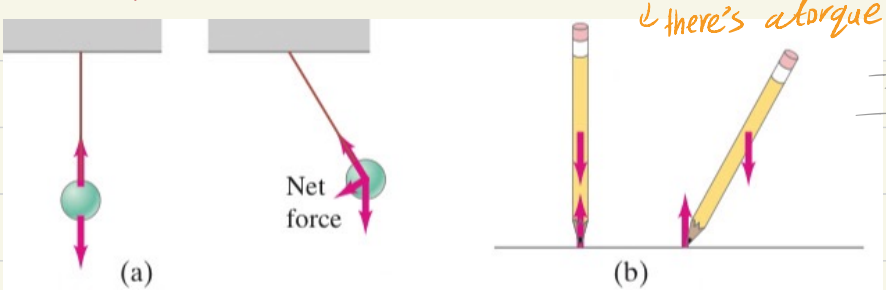
$\Sigma \tau = 0$ $\Sigma F = 0$

However if the object is displaced slightly:

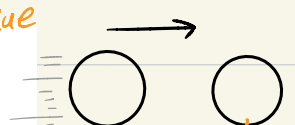
1 stable equillibrium
↓
it returns to its orginal position

2 unstable equillibrium
↓
moves farther from its orginal position

3 neutral equilibrium
↓
remains in its new position



↓ there's a torque



no tourque acts on it

** in general an object whose center of gravity ("CM") (CG) is below its point of support; it will be in stable equillibruim **

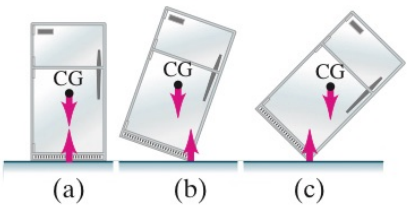


FIGURE 9–16 Equilibrium of a refrigerator resting on a flat floor.

* Tipped slightly → return to its position due to torque

* " too far → it will fall over

* critical point is reached when the CG shift from one side of the pivot point to another

Fig. 9–16c. In general, *an object whose center of gravity is above its base of support will be stable if a vertical line projected downward from the CG falls within the base of support.* This is because the normal force upward on the object (which balances out gravity) can be exerted only within the area of contact, so if the force of gravity acts beyond this area, a net torque will act to topple the object.

the larger the base and lower the CG the more stable the object

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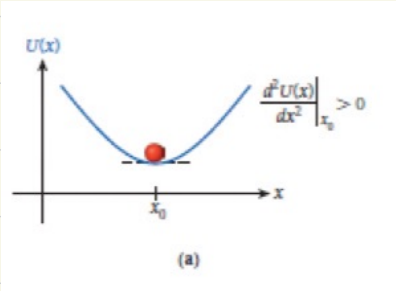
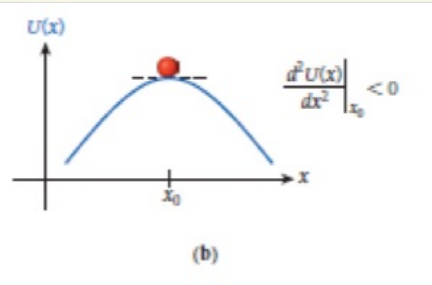
Stable equillibrium due to resorting force that drives the system back to equillibrium



unstable equillibrium



neutral Equillibrium