3. Mind Map: Work Done by Gravity

Work Done by Gravity

- 1️⃣ What is Work? A Quick Recap
  - Work is energy transfer caused by a force that displaces an object.
    - $W = F.d = F\,d\cos(\theta)$
      θ is the angle between the F and d
  - 1. Positive Work → When force and displacement are in the same direction ($0° < \theta < 90°$)
  - 2. Negative Work → When force and displacement are in opposite directions ($90° < \theta < 180°$)
- 2️⃣ Work Done by Gravity (Gravity always acts downward 🔻)
  - Object moving upward 🔺
    - Displacement is up, force is down → $\theta = 180°$
    - Work by gravity = $(mg)\,d\,\text{Cos}(180°) = -mgd$
  - Object moving downward 🔻
    - Displacement is down, force is down → $\theta = 0°$
    - Work by gravity = $Fd\cos(\theta) = (mg)\,d\cos(0°) = mgd$
- 3️⃣ Example: 🍎 Apple's Flight
  - Going up:
    - You give the apple an initial velocity (v_0) → kinetic energy is imparted.
    - Gravity slows it down by doing negative work
    - At the top: velocity = 0, KE = 0, work done by gravity = $-mgd$
  - Coming down:
    - Gravity and displacement align.
    - Work done by gravity = $+mgd$
    - Kinetic energy increases as it falls

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