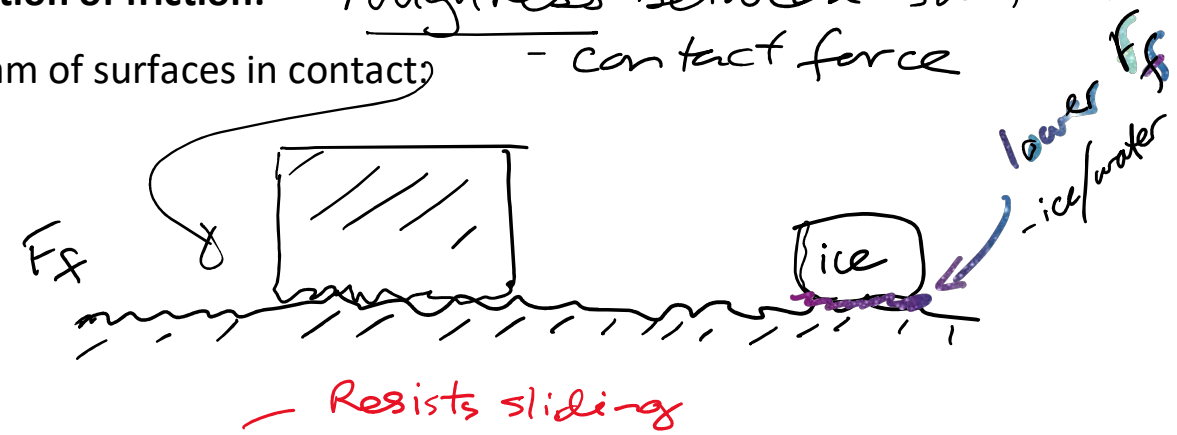
Physics 11 lesson – Friday March 1, 2024 – Force of Friction

Chapter 3.3 and 3.4 – Pages 96 to 108

Chapter 3.3

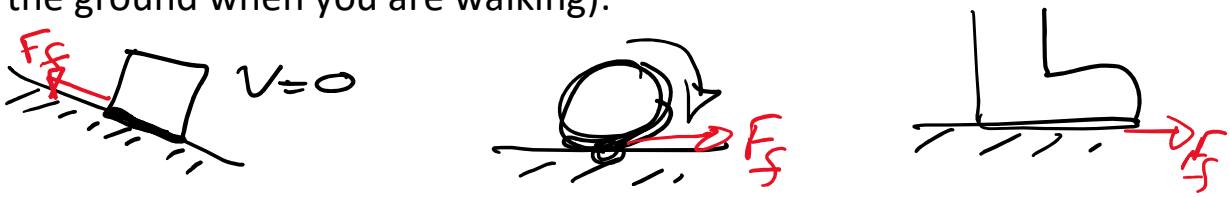
Definition of friction: roughness between surface - contact force

Diagram of surfaces in contact:



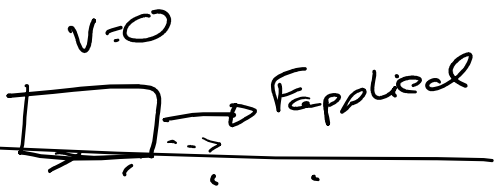
Resists sliding

- **Static friction** (stationary objects, including the friction between the wheels and the ground when objects are rolling, and between your feet and the ground when you are walking):



- **Starting friction** (the cusp between the object being stationary and sliding):

eg.



Ms on data table? pg 101

FA just gets the object moving

- **Kinetic friction** (the object is sliding … not rolling)

acts opposite to the direction of motion

Strategies to reduce friction (e.g. speed skaters and skiers, and components in motors that need to slide within the motor)

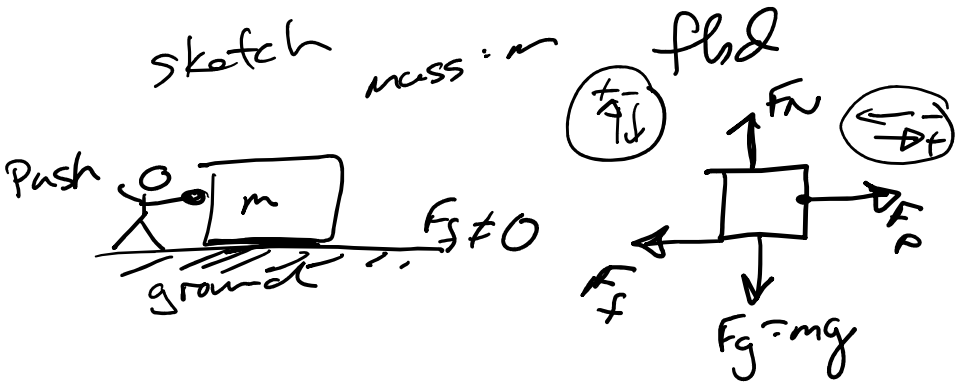
- oil — WD40
- polish surface (smooth)
- e.g. air table (like air hockey)

Strategies to increase friction (e.g. shoes needed for sports, and car tires on roads, and objects that need to stay at rest on the ground including ramps)

- increase roughness
- reduce lubrication

Chapter 3.4

- Free body diagram:



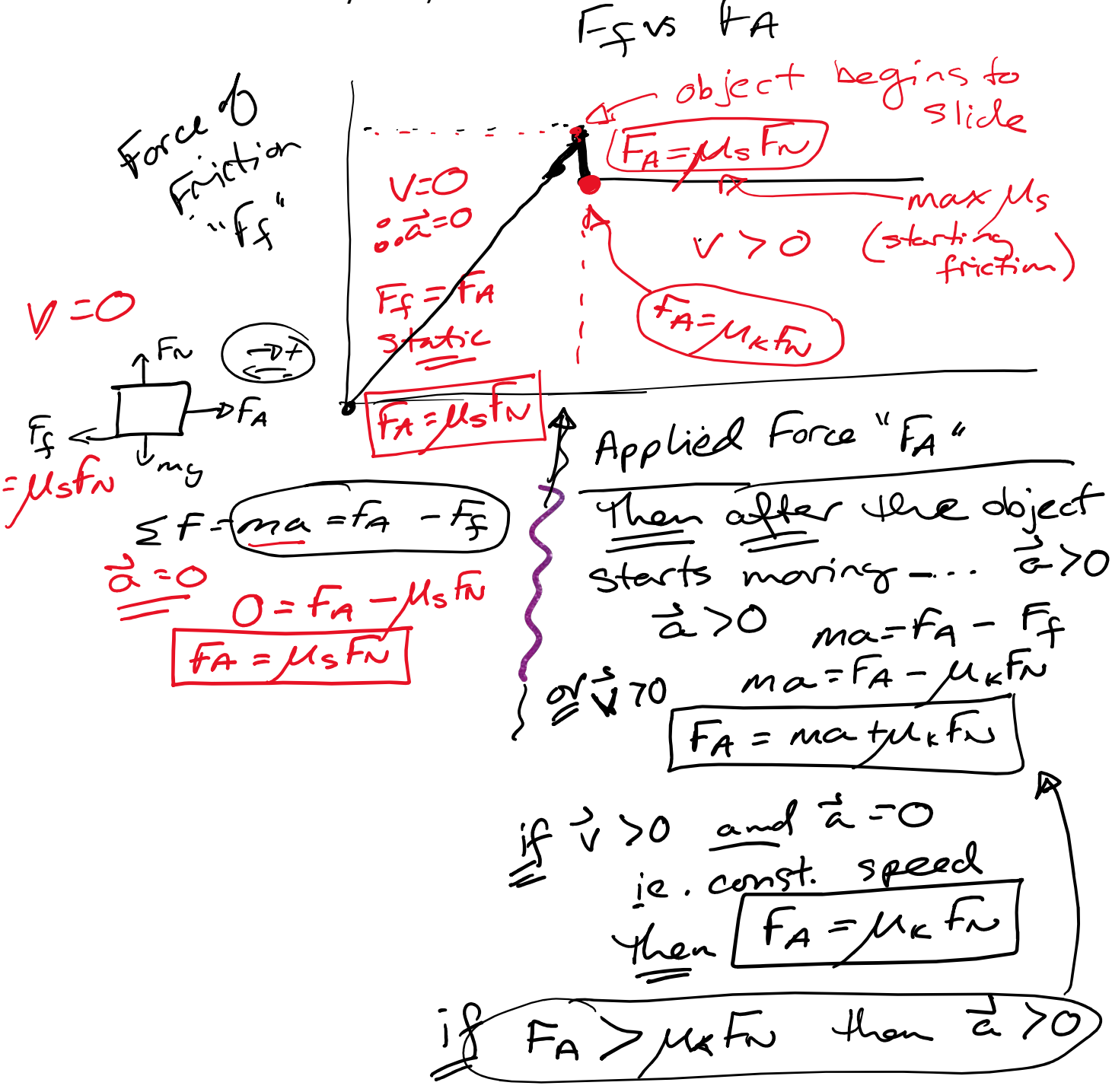
- Coefficient of friction (ratio of F_f/F_N):

- a measure of the degree of roughness between the surfaces

$$\mu = \frac{F_f}{F_N}$$

- Equation for friction $\mathbf{F_f = \mu F_N}$

- Page 101 – Refer to Table 1, comparing **coefficients of static friction (μ_S) vs coefficient of kinetic friction (μ_k)**
- GRAPH of Applied Force vs friction (F_A vs F_f) for an object being pushed horizontally on a level surface – Note: this in NOT in your textbook (and I have no idea why not?)



- Newton's 2nd Law equation applications when friction is present
    - Use the coefficient of Static friction of the object is not sliding across the surface, and coefficient of Kinetic friction if it is sliding
    - **Always** start with the FBD **AND** sign convention!!!
    - **THEN** Newton's 2nd Law: **∑F =** m**a**