Name: _____ Physics 11

Newton's Third Law
and Free Body Diagrams

Newton's Third Law: For every action (force) there is an equal and opposite reaction (force).

in magnitude in direction

In a sense, every force has a buddy.

Examples:

Situation	Action Force	Reaction (Buddy) Force
Runner accelerates	Runner pushes ground backwards	Ground pushes runner forwards
Rocket flies upwards	Rocket pushes exhaust down	Exhaust pushes rocket up
Bug hits windshield	Car pushes bug forward (splat!)	Bug pushes car backward

Free Body Diagram: A diagram of the forces acting on an object.

Two Rules of FBD's (Free Body Diagrams):

1. The body must be free (draw only the object of interest, no others)
2. Draw ALL the forces acting on the body.

Typical forces we use in FBDs:

Force	Symbol	Description
Gravity	F_g	- Pull from the Earth (or anything with mass).
Friction	F_f	- Always opposes motion when an object slides or tries to slide. - Acts parallel to the interface between the two objects.
Normal	F_n	- Occurs whenever one object slides or rests against another. - Acts perpendicular to the interface between the two objects.
Tension	F_t or T	- Force at both ends of a rope AND within it (assuming the rope is "massless").
Elastic or Spring	F_e or F_s	- Force from something being stretched or compressed.

Example: Draw a FBD for a sled being pulled at constant velocity.