Your group has a plastic surface and a contour map that represent the gravitational potential energy of a space station-Earth system as a function of the position of the space station relative to Earth. Solve the following problems together and discuss the results.

Compare Potentials: Rank the three points marked on the surface by gravitational potential energy from highest to lowest.

Identify Forces: What direction is the gravitational force at each of the marked points? Indicate the direction of each force with a vector on the contour map.

Rank the three points by the magnitude of the gravitational force.

Plot: Sketch a graph of the gravitational force *vs.* distance from the center of the Earth. Use the convention that positive forces point *away* from the center of the Earth.

Examine Changes: At each point, imagine that the space station moves a small distance (about 10 m) directly toward the center of the Earth.

1. At each point, is the resulting *change in gravitational potential energy* positive, negative, or zero?
2. Rank the three points by the *magnitude* of the change in gravitational potential energy.

Relate the Surfaces: The yellow surface represents the gravitational potential energy of an object close to the surface of Earth. How it is possible for both surfaces to correctly represent the gravitational potential energy when the object is near the Earth's surface?

Generate Graphs: Draw graphs of gravitational potential energy vs. distance and gravitational force vs. distance for the yellow surface.

Find Patterns: Examine the graphs of gravitational potential energy and force for both the green and yellow surfaces.

What patterns do you see between gravitational force and gravitational potential energy?