PHYSICS 3800: ASSIGNMENT #1

DUE: Wednesday January 13, 2016

QUESTION #1

SHADOWS

(a) Assume you have a stick that rises 1.00 m above the ground vertically and the Sun is at its zenith on December 21 (winter solstice). Calculate the length of the shadow if the stick is located in Lethbridge (radius = 6732 km, $49^o41'39''$ N, $112^o49'58''$ W).

(b) Assume you have a stick that rises 1.00 m above the ground vertically and the Sun is at its zenith on December twenty first (winter solstice). Starting in Lethbridge, how far north and how far south do you have to travel for the length of the shadow to change by 3.00 cm.

TIME

(c) If the Sun is at its zenith at noon in Lethbridge (radius = 6732 km, $49^o41'39''$ N, $112^o49'58''$ W), at what time will the Sun be at its Zenith in Banff (radius = 6732 km, $51^o10'41''$ N, $115^o34'19''$ W)?

FORCES

Your body is in Lethbridge (radius = 6732 km, $49^o41'39''$ N, $112^o49'58''$ W) during the summer solstice at noon during a solar eclipse. (The moon lies on the ecliptic.) You may ignore the gravitational attraction of the other planets, etc. You may also ignore the orbital motion of the Earth around the Sun, the air pressure and the buoyant force.

(d) Calculate the net force acting on your body.

(e) Calculate the force acting on your body by the Earths surface (find the normal component, the static friction, the tangential component, and the magnitude). Assume the acceleration due to gravity in Lethbridge has a magnitude of $g = 9.8068$ m/s^2.

GONE HIKING

(f) Suppose you start in Lethbridge (radius = 6732 km, $49^o41'39''$ N, $112^o49'58''$ W) and walk 3,600 km South, then 1,200 km East and finally 2,000 km North. How far are you from your starting position (magnitude of the displacement vector), and how far do you have to travel to get back?

QUESTION #2

Problem 3.4 on page 109

QUESTION #3

Problem 3.5 on page 109

QUESTION #4

Problem 3.6 on page 109