PHYS319 Assignment.

**Problem 1.**

In no more than 250 words, explain why planetary rotation implies a natural choice of spherical and Cartesian coordinates.

**Problem 2.**

We discover a planet, X, that is exactly like Earth, except the days are 3 hours long.

1. What is the angular velocity on X?
2. What is the tangential velocity at the equator?
3. Suppose we apply the f-plane approximation, in which we use Cartesian coordinates at small scales. When playing for the Earth vs X-planet game at Elon Musk’s new settlement at 45°S, Richie Mo’unga kicks a rugby ball downfield at 25m/s with a flight time of 4s. How much does the ball deflect due to Coriolis effects? Assume he is kicking south-north. Discuss this with reference to the number for Earth.
4. On a slowly rotating planet, the Hadley Cell can encompass the whole world. On some such planets, there is likely to be a large blob of cloud pretty permanently at the place where the local sun is shining perpendicularly to the surface (the substellar point). Why would this be the case? What’s happening on the other side of the world?

**Problem 3.**

What is the difference between the carbon-carbon feedback and the carbon-climate feedback, and explain how each of them affects the relationship between forcing and temperature at the global level.

(250 words)