Classical Mechanics

Do <u>two</u> of the following three problems, each on a separate page (or pages) and write your name on every page you turn in.

Problem 1

A particle is scattered by a central potential centered at the origin. The potential is short-ranged, such that $V(r) = 0$ for $r > 1$. The particle initially approaches with a velocity $v_0\vec{e}_x$, passing through the point $-2\vec{e}_x - (1/2)\vec{e}_y$. What is its velocity vector when it is moving away from the origin, passing through the point $2\vec{e}_y$?

Problem 2

Which direction does the Coriolis force push the following (no force, N, S, E, W, up, down, left, right, clockwise, counterclockwise, or other directions).
Hint: the Coriolis force is given by $-2m\vec{\omega} \times \vec{v}$ where m is the object's mass, $\vec{\omega}$ is the Earth's rotational vector pointing out the north pole, and v is the object's velocity vector.

a) a jet going north over the equator

b) a jet going west along the equator

c) a rocket going up at the equator

d) a pendulum at the equator viewed from above (give rotational direction).

e) a jet flying across the south pole. (Hint: north is not an acceptable answer here).

f) a rocket going up at the south pole.

g) a pendulum at the south pole viewed from above (give rotational direction).

h) A rocket going up at 32 N.

i) you have a rock on a string that you (at 32 N latitude) swing around your head in a counterclockwise direction when viewed from above. Does the Coriolis force increase, decrease, or not affect the tension?

j) a jet flying southward from Albuquerque to El Paso.