Quiz 7.6 – Rotational Motion

Name: _____

New Coordinate Systems

For rotations (and other systems, later) we will use non-cartesian coordinate systems. For cylindrical and spherical polar coordinates give:

- The Laplacian operator (∇^2)
  - Cylindrical:
  - Spherical Polar:
- The Jacobian (infinitesimal volume element)
  - Cylindrical:
  - Spherical Polar:
- An integral of function $F(\tau)$ over all space, with the correct limits of integration and Jacobian
  - Cylindrical:
  - Spherical Polar:

Rotation and Quantum Numbers

Quantum mechanical states are labeled by their *quantum numbers*. Give the symbol, name, and relation to observable properties for the quantum numbers in the following systems:

- Particle on a Ring
- Rigid Rotor

Rigid Rotor

Consider a 3-dimensional rigid rotor with a moment of inertia $I = 7.4 \times 10^{-47}\ kgm^2$

- Give the energy (in J) and total angular momentum of the $l = 2$ energy level

- List all of the allowed values for the z-component of the angular momentum

- List all the observables of a rigid rotor which we can know simultaneously

- List all pairs of observables for which there exists an uncertainty relationship