1. A steady coordinated turn represents a turn at constant flight speed and zero angular acceleration with the body y-axis accelerometer reading being zero. Neglect earth’s rotational and curvature effects and assume zero wind condition. What are the equations of motion describing this maneuver?

2. Linearize the pitching and yawing moment equations, i.e., equations for $\dot{p}$ and $\dot{r}$, about a steady rolling equilibrium flight.

3. If the slope of the $C_m$ versus $C_L$ curve is -0.15 and the pitching moment at zero lift is equal to 0.08, determine the trim lift coefficient. If the center of gravity of the airplane is located at $h/\bar{c} = 0.3$, determine the stick fixed (fixed elevator position) neutral point.

4. For the data shown below, determine the following:
   (a) The stick fixed neutral point.
   (b) If we wish to fly the airplane at a velocity of 125 ft/s at sea level, what would be the trim lift coefficient and what would be the elevator angle for trim?

5. Analyze the canard-wing combination shown below. The canard and wing are geometrically similar and are made from the same airfoil section.

   $AR_c = AR_w$
   $S_c = 0.2S_w$
   $\bar{c}_c = 0.45\bar{c}_w$

   (a) Develop an expression for the moment coefficient about the center of gravity. You may simplify the problem by neglecting the upwash (downwash) effects between the lifting surfaces and the drag contribution to the moment. Also assume small angle approximations.
   (b) Find the neutral point for this airplane.
6. The $C_m$ versus $\alpha$, a curve for a large jet transport can be seen below. Use the figure and the following information to answer questions (a) to (c).

\[ C_L = 0.03 + 0.08\alpha \]
\[-15^\circ \leq \delta_e \leq 20^\circ\]

(a) Estimate the stick fixed neutral point.
(b) Estimate the control power $C_{m\delta_e}$.
(c) Find the forward center of gravity limit.