Read Etkin and Reid Chapter 3, sections 1 & 2 for detail, 3-7 for general ideas.

Chapter 5, 5.4

An aircraft (business jet - Jetstar) has the following aerodynamic properties:

Mach 0.2 @ sealevel and Mach 0.8 @ 40,000 ft

<table>
<thead>
<tr>
<th>Mₘ</th>
<th>Cₐₗ</th>
<th>C₅</th>
<th>Cₐ₉</th>
<th>C₅₉</th>
<th>Cₐ₉ₗ</th>
<th>Cₐ₉ₐ</th>
<th>C₈₉</th>
<th>C₅₉ₗ</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) 0.2</td>
<td>0.737</td>
<td>0.095</td>
<td>5.0</td>
<td>0.75</td>
<td>-0.8</td>
<td>0.0</td>
<td>-8.0</td>
<td>0.4</td>
</tr>
<tr>
<td>2) 0.8</td>
<td>0.4</td>
<td>0.04</td>
<td>6.5</td>
<td>0.6</td>
<td>-0.72</td>
<td>0.0</td>
<td>-0.92</td>
<td>0.44</td>
</tr>
</tbody>
</table>

Its physical characteristics are given by:

\[ W = 38,200 \text{ lbs} \quad h = 0.25 \quad S = 545.5 \text{ ft}^2 \quad \bar{c} = 10.93 \text{ ft} \quad b = 53.75 \text{ ft} \]

18. Determine the following: at each flight condition:
   a) L/D
   b) Thrust Required
   c) Stick fixed neutral point
   d) Elevator angle / g
   e) Stick-fixed maneuver point

19. What is the change in elevator angle to from Mach 0.2 in condition one to Mach = 0.4?
   Assume that there are no Mach number effects on the aerodynamic properties and that the flight is straight and level.

20. In the last homework the horizontal tail was located at the tip of the vertical fin (a T tail). In our developments we neglected the contribution to the moment due to the z offset. Likewise for a wing. This offset will contribute to the pitch moment slope to some extent and hence modify the pitch stability parameter, \( C_{m_z} \). Develop an expression for the additional term to be added to our current expression for \( C_{m_z} \).
   a) That is find the \( \Delta C_{m_z} \) due to the z location of the wing. State any assumptions that you make.
   b) Using your expression, determine if a high wing (negative z location) is stabilizing or destabilizing with regard to pitch static stability. Explain.