Question #3

>> Solution

To solve this problem I will be using the function **lift_drag_cal.mlx** to find the drag for the certain airplane given in the instruction.

>> Code

Preparation

```
weight = 5000; % weight of the aircraft [lb]
vel = 200; % velocity [mi/hr]
wing_area = 200; % wing surface area [ft^2]
AR = 8.5; % Aspect ratio of wing
e_oswald = 0.93; % Oswald efficiency factor
rho = 2.3769 * 10^(-3); % air density [slug/ft^3]

% Converting the velocity to ft/s
vel = 293.333; % [ft/s]

% Because the condition is that L/D is maximum
% the zero lift drag coefficient is calculated using the following relation
```

at $\left(\frac{L}{D}\right)_{\text{MAX}}$ or in other words $\left(\frac{C_L}{C_D}\right)_{\text{MAX}}$

$$V_{\text{Tmin}} = \sqrt{2\frac{W}{\rho S}\sqrt{\frac{K}{C_{\text{D0}}}}} \text{ , where } K = \frac{1}{\pi \text{eAR}}$$

thus,

$$C_{\text{D0}} = \frac{1}{\pi \text{eAR}}\left(\frac{W}{\frac{1}{2}\rho V^2 S}\right)^2$$

```
% Thererfore zero lift drag coefficient is
C_D0 = (1 / pi / e_oswald / AR) * (weight / 0.5 / rho / vel^2 / wing_area)^2
```

```
C_D0 = 0.0024
```

Calling Function

```
[lift, drag] = lift_drag_cal(rho, vel, wing_area, C_D0, weight, AR, e_oswald);
```

Answer

```
fprintf('The drag on the airplane is:  %.6f lb', drag);
```

```
The drag on the airplane is:  98.443149 lb
```