Q1: $S_2 = 2S_1$, Neglecting Re effects on drag on a flying wing

then $D_p = \frac{1}{2}\rho V^2 \cdot S \cdot C_{D_p}$ (1)

if you neglect Re effects from the change in size, $C_{DP_1} \simeq C_{DP_2}$ (as $C_f = f(Re)$ won't change)

However, $D_{P_2} \simeq 2 D_{P_1}$, by equation (1)

Q2. Givens:

$W = 17,854$ lbs

$V = 146$ KIAS

$f = 8.2\ ft^2$

$b = 62$ ft

$e = 0.8$

alt = 25,000 ft (standard day)

Wanted: total drag (Neglect compressible drag)

then $q = \frac{1}{2}\rho V^2$ (ρ: sea level ρ; V: indicated)

$= \frac{1}{2}\left(0.00238 \frac{slug}{ft^3}\right)\left(146\ KIAS \cdot 1.69 \frac{ft/s}{kts}\right)^2$

$= 72.1\ lb/ft^2$

then $D_p = fq$

$= 9.5\ ft^2 \cdot 72.1 \frac{lb}{ft^2} = 590.9\ lb$

$D_i = \frac{1}{\pi q e}\cdot\left(\frac{L}{b}\right)^2 = \frac{1}{\pi(72.1 lb/ft^2)(0.8)}\left(\frac{17854\ lb}{62\ ft}\right)^2$

$= 457.8\ lb$

then $D_{total} = 590.9\ lb + 457.8\ lb$

$= 1048.8\ lb$

Q3: Given NACA 2420

$c = 5$ ft

what is max thickness?

NACA 2420

↳ last 2 digits are t/c in 1/10ths of chord

then $t = t/c \cdot c$

$= .2 \cdot 5$ ft

$= 1$ ft $= 12$ inches

Q4:

Givens: $b = 175\ ft$

$S = 3420\ ft^2$

$t/c = 0.13$

$\Lambda = 29°$

$\sigma = 0.24$

$C_{r_E} = 29.43\ ft$

$C_f = 0.0030$

$M_0 = 0.5$

Wanted: f_{wing}

Then $f = K \cdot C_f \cdot S_{wet}$

$= K_{wing} \cdot C_{f\,wing} \cdot 2 \cdot 1.02 \cdot S$ ← assume to be $S_{REF\,exposed}$ since fuselage info not given

However, if you used dimensions above correctly to determine the S_{REF} exposed using C_{r_E}, you will also get full credit for this part

Need K_{wing}, you can use Fig 11.3 since this aircraft is travelling @ $M_0 = 0.5$, or can use the equations provided

$$Z = \frac{(2 - M_0^2)\cos\Lambda}{\sqrt{1 - M_0^2 \cos^2\Lambda}} = \frac{(2 - 0.5^2)\cos(29°)}{\sqrt{1 - 0.5^2 \cos^2(29°)}} = 1.702$$

then $K = [1 + Z(t/c) + 100(t/c)^4]$

$= [1 + 1.702 \cdot 0.13 + 100(0.13)^4]$

$= 1.25$

then $f = 1.25 \cdot 0.003 \cdot 2 \cdot 1.02 \cdot 3420 \, ft^2$

$= \underline{26.48 \, ft^2}$