PROBLEM 1

$$T_R = D \qquad [oz]$$

$$= \frac{1}{2} \rho V^2 S C_D$$

$$T_R = \frac{C_D \cdot \sigma \cdot V^2 \cdot S}{3519}$$

$C_D = .04$ [Lec6. Way too low] Probably .2 - .4

$\sigma = 1$

$V = 13.64$ mph

$S = 450$ sq in

$$T_R = \frac{(.04)(1)(13.64)^2(450)}{3519} \qquad [oz]$$

$T_R = .95$ oz

PROBLEM 2

$$T_R = D$$

$$= \frac{1}{2} \cdot \rho \cdot V^2 \cdot S' \cdot C_D$$

$$T_R(V) = \frac{C_D \cdot \sigma \cdot V^2 \cdot S'}{3519}$$

$$C_D = C_{D0} + \frac{C_L^2 (1+\delta)}{\pi AR}$$

$$C_D = .015 + .06\, C_L^2 \quad \text{[Lec6]}$$

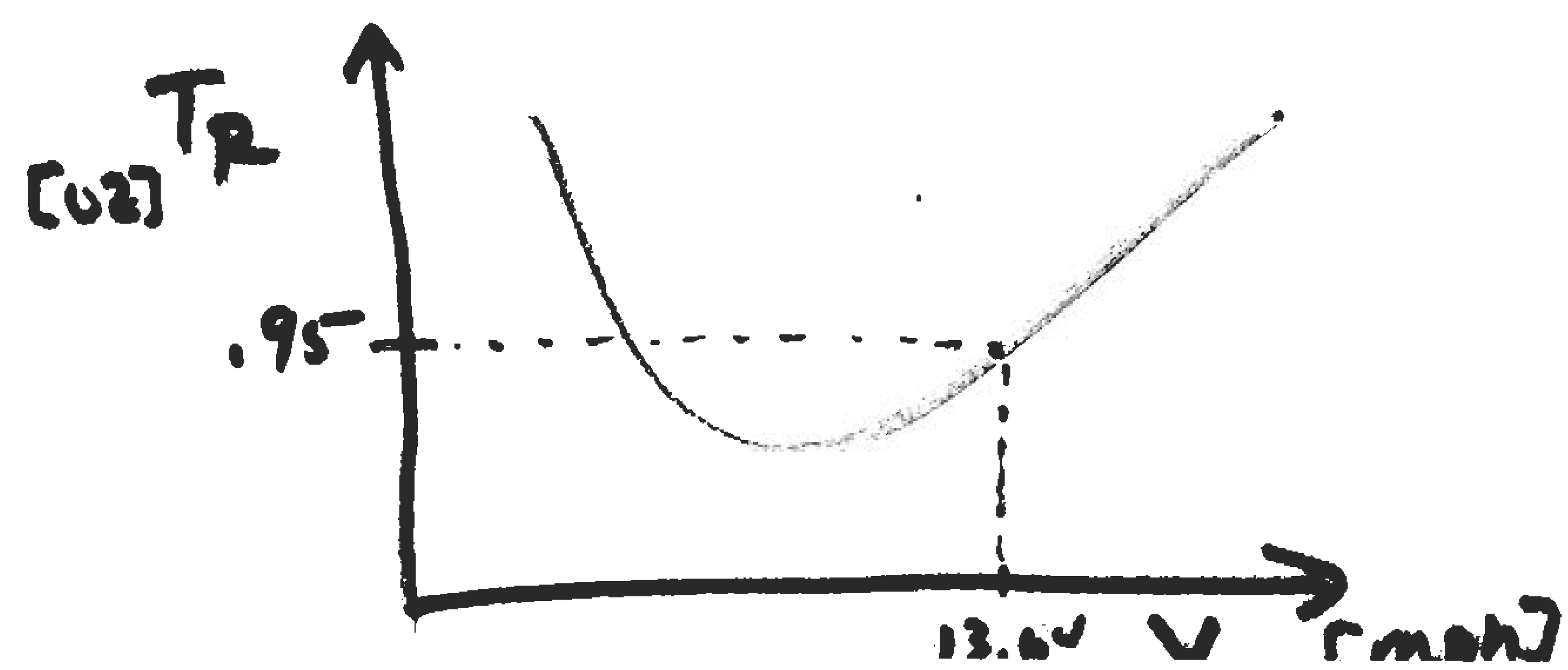
$$C_L(V) = \frac{3519 \cdot W}{\sigma \cdot V^2 \cdot S'}$$

$$W = 15 \text{ oz}$$

$$\sigma = 1$$

$$S' = 450 \text{ in}^2$$

PLOT T_R AS A FUNCTION OF V



PROBLEM 3

$$P_A = T_A \cdot V$$

$$T_A = \frac{P_A}{V}$$

$$[oz]\ T_A = K \cdot \frac{P_A\ [W]}{V\ [mph]}$$

$$P_A = \eta_{prop} \cdot P_M$$

$$\eta_{prop} = .8$$

$$P_M = (E - R_i \cdot I_m) \cdot (I_m - I_o) \quad [Lab]$$

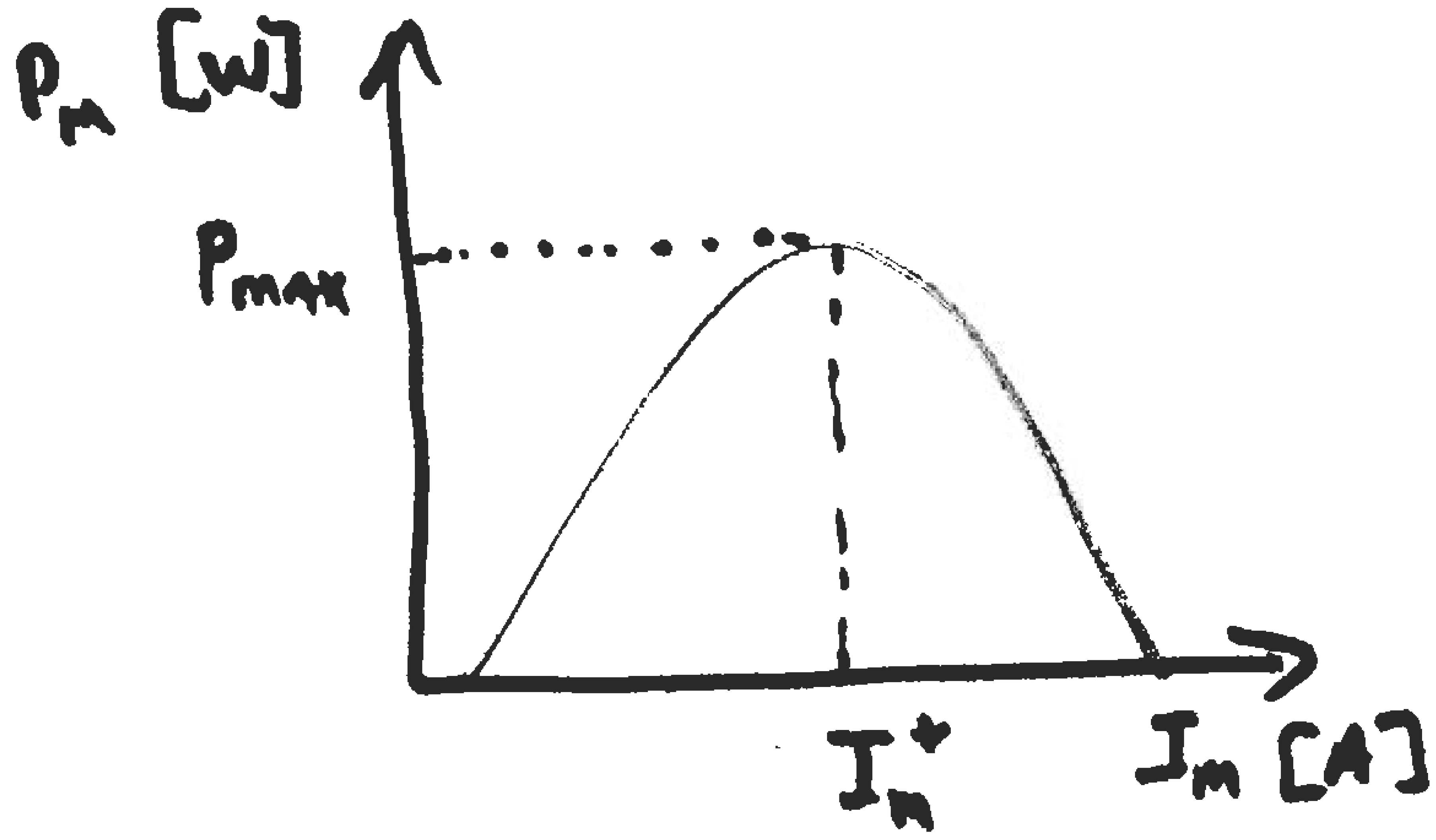
I_m variable

$E = 7.2$ or 8.4 [V], [W/A]

$R_i = 0.357\ [\Omega]$

$I_o = 0.72$ [A]

PLOTTING P_M AS A FUNCTION OF I_M

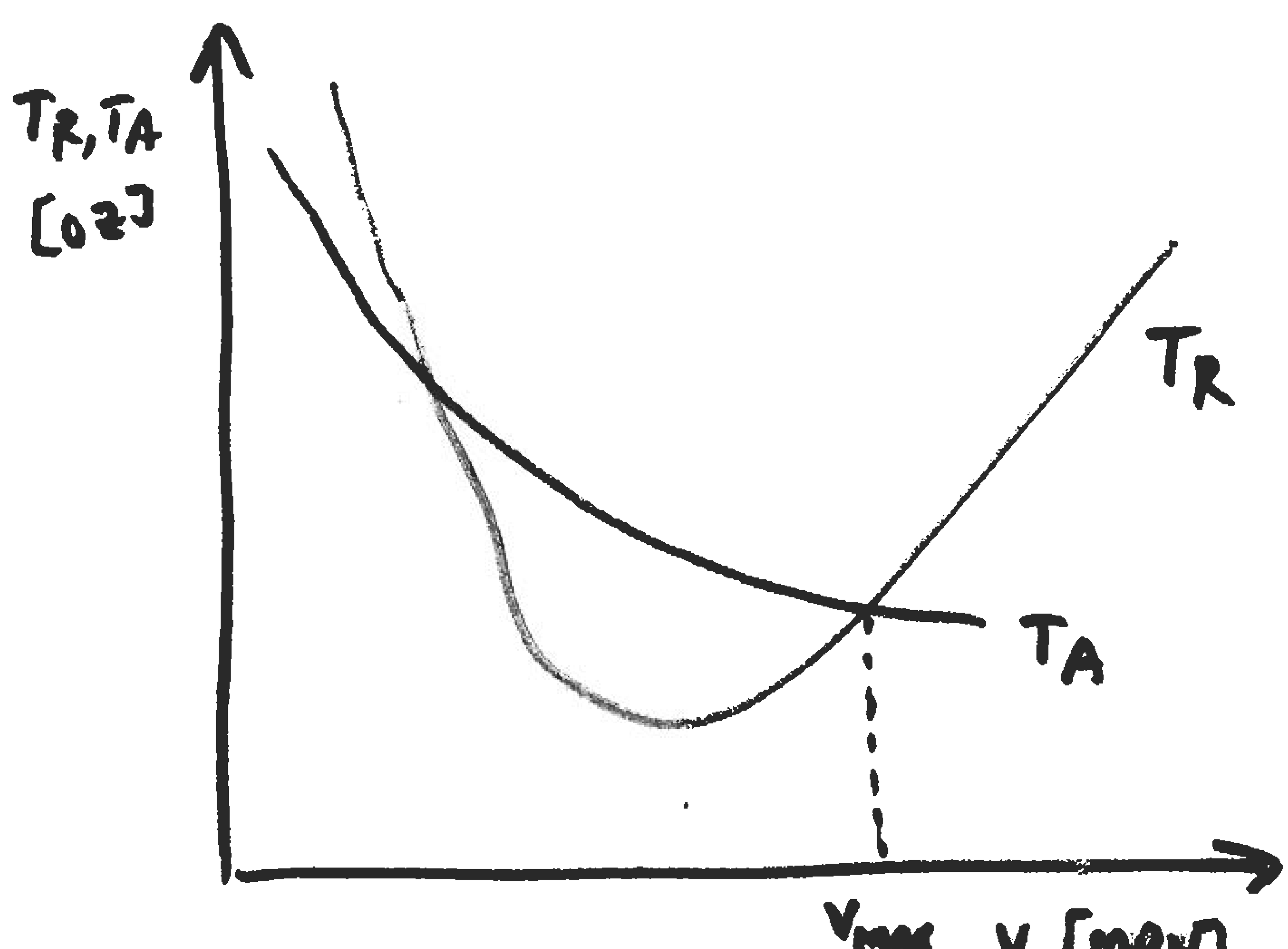


MAXIMUM MOTOR POWER OCCURS AT I_M^*

CONCLUDE THAT P_A IS APPROX CONST

$$P_A = \eta_{prop} \cdot P_{max}$$

DRAW T_R & T_A AS A FUNCTION OF V



PROBLEM 4

- PLOT MOTOR POWER AS A FUNCTION OF MOTOR CURRENT

$$P_M(I_m) = (E - R_i \cdot I_m) \cdot (I_m - I_0)$$

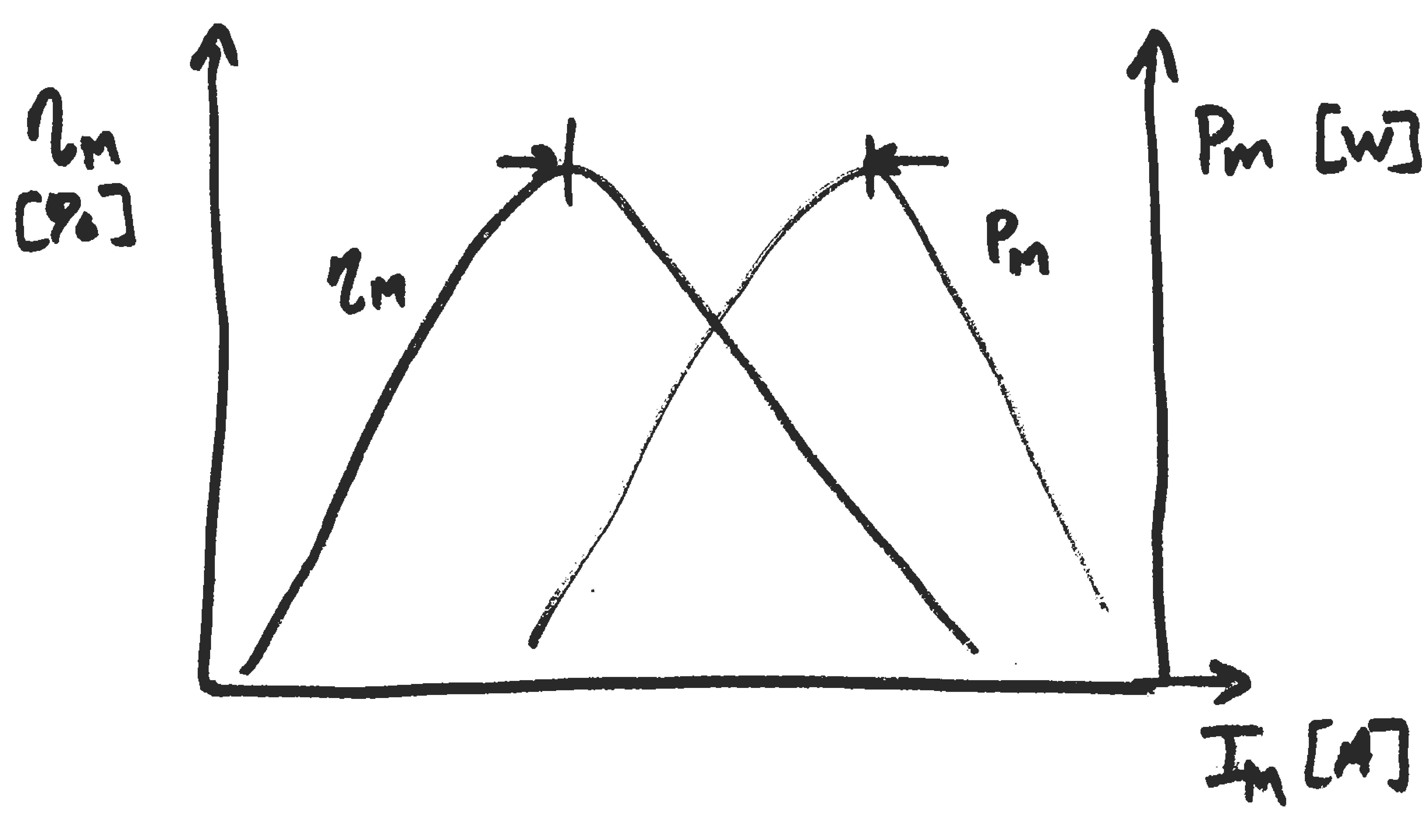
- PLOT MOTOR EFFICIENCY (η_m) AS A FUNCTION OF MOTOR CURRENT (I_m)

$$\eta_m = \frac{P_m}{P_{in}}$$

WHERE POWER INTO THE MOTOR P_{in} IS

$$P_{IN} = E \cdot I_M \ [W]$$

* YOU WILL NEED DIFFERENT SCALES +



PROBLEM 5

- $P_R = T_R \cdot V$

  $P_R = D \cdot V$

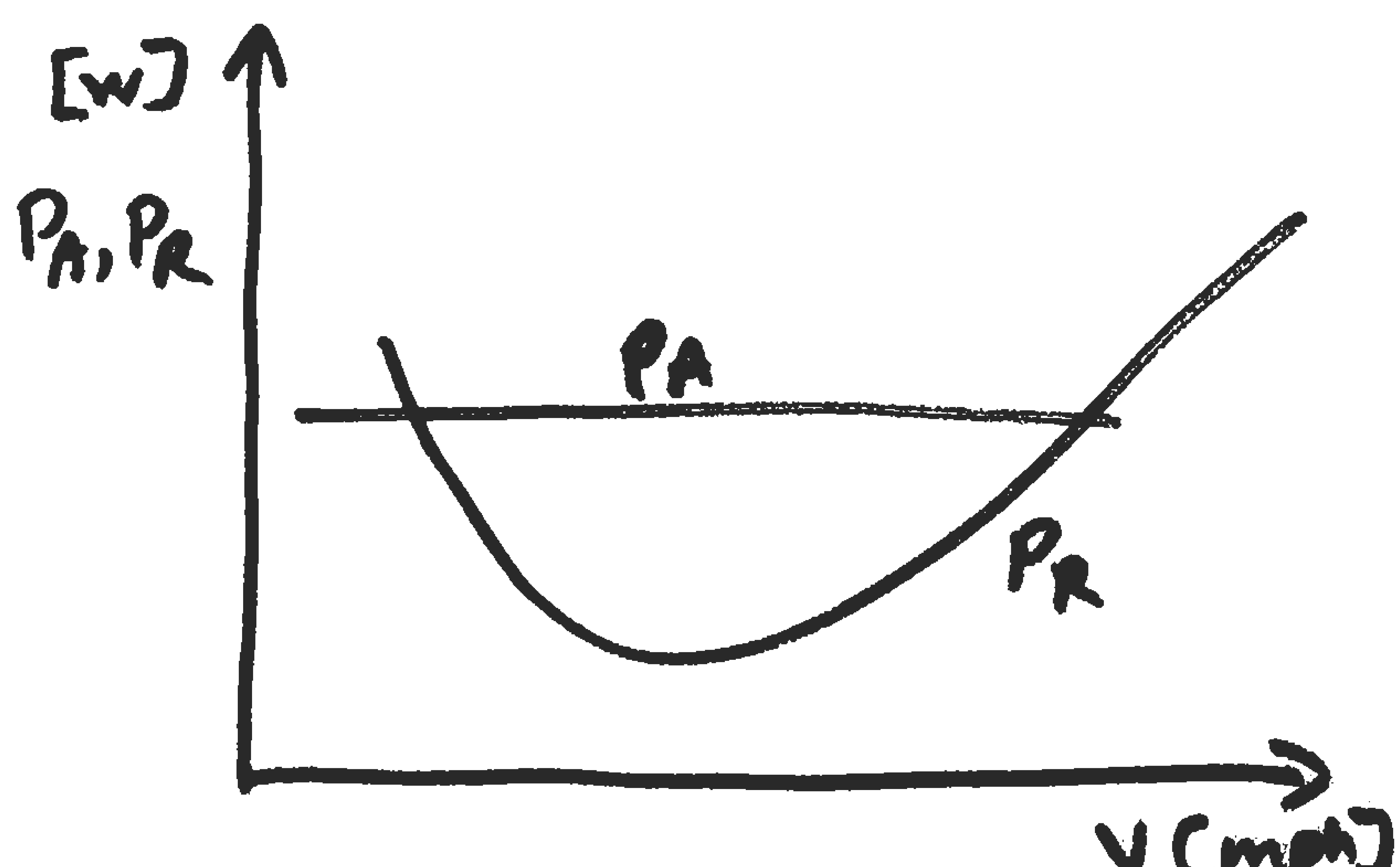
$$[W] \quad P_R = \frac{C_D \cdot \sigma \cdot V^2 \cdot S}{3519} \cdot V \cdot K \quad [\text{in}][\text{mph}]$$

$$C_D = .015 + .06\, C_L^2$$

$$C_L = \frac{3519 \cdot W}{\sigma \cdot V^2 \cdot S}$$

- $P_A = \eta_{prop} \cdot P_M$

  $P_A = \eta_{prop} \cdot P_{MAX}$



PROBLEM 6

$$[\text{mph}] \quad V_{STALL} = \sqrt{\frac{2}{\rho} \cdot \frac{W}{S} \cdot \frac{1}{C_{L_{MAX}}} \cdot \underset{\sim}{K}}$$

EQ 5.67, p 254 ANDERSON

$W = 15$ [oz]

$S = 450$ [in^2]

- C_L MAX? EITHER KNOW FROM FUNDS PROBLEM SET OR GUESSED TYPICAL VALUE

AN ACCEPTABLE GUESS FOR $C_{L_{MAX}}$ IS .9

PROBLEM 7

ANDERSON
[6.33], p 331

$$R_{MIN} = \frac{4 \, (K) \, (W/S)}{g \cdot \rho \cdot (T/W) \cdot \sqrt{1 - \frac{4 \cdot K \cdot C_{D0}}{(T/W)}}}$$

$$K = \frac{(1+\delta)}{\pi AR} = .06$$

- WHAT UNITS DO YOU WANT FOR R_{MIN}? [ft]

W KNOWN [oz]

S KNOWN [sq in]

T KNOWN [oz] PROBLEM 1

g KNOWN [?]

ρ KNOWN [?]

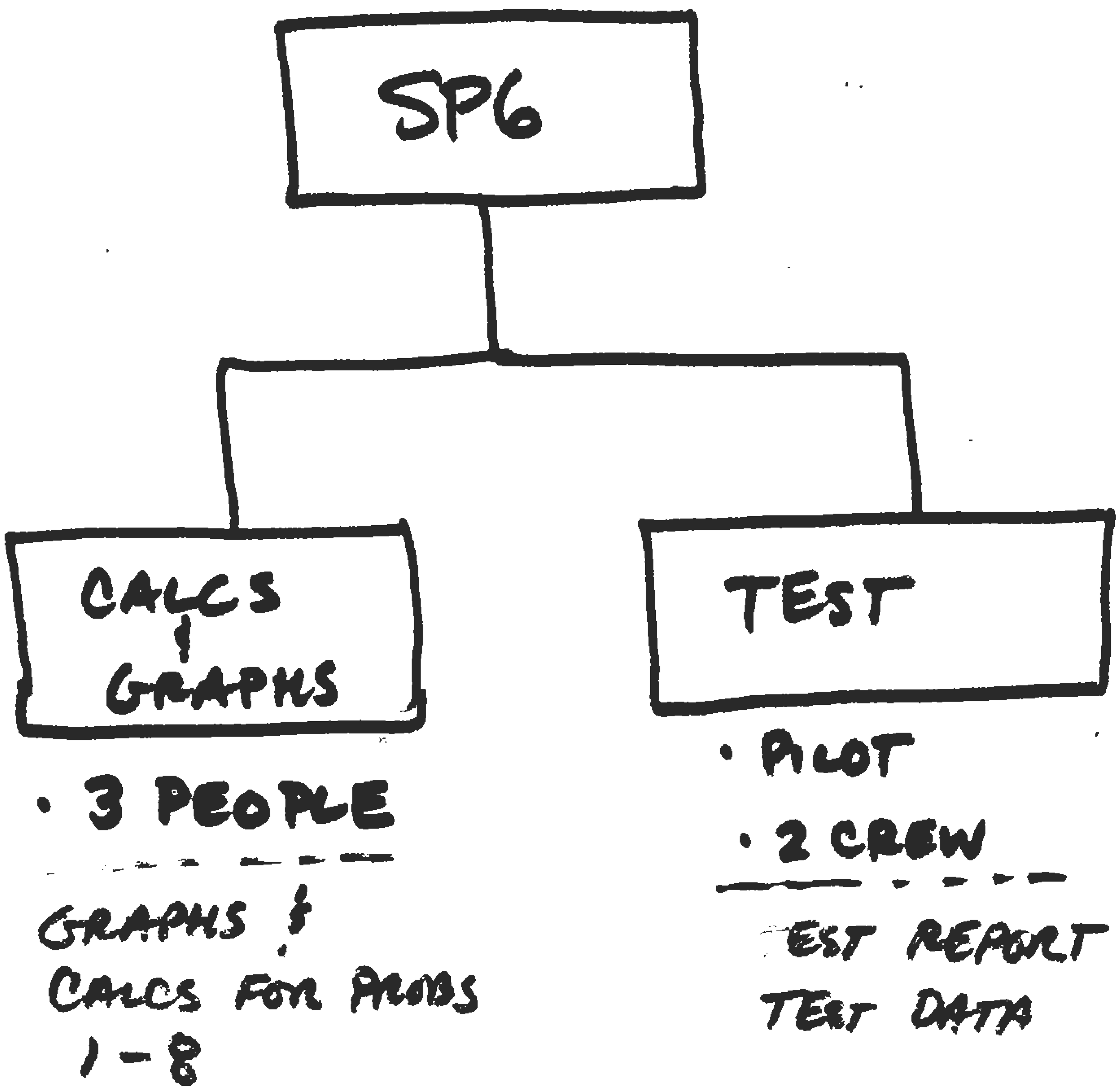
PROBLEM 8

ANDERSON, EQ [6.95], P 362

$$S_g \approx \frac{1.21 \cdot (W/S)}{g \cdot \rho \cdot C_{L_{MAX}} (T/W)} \cdot C_1$$

- WHAT UNITS DO YOU WANT FOR S_g? [ft]

WBS


SP6
CALCS & GRAPHS
TEST
• 3 PEOPLE
GRAPHS & CALCS FOR PROBS 1 - 8
• PILOT
• 2 CREW
TEST REPORT
TEST DATA