PROBLEM 1-12

GIVEN: SPECIFIC WEIGHT OF BRASS $= 520\ lb/ft^3$ (WEIGHT/VOLUME)

REQUIRED: DENSITY IN SI UNITS (MASS/VOLUME)

$$\rho = 520\ lb/ft^3 * 4.4482\ N/lb * \left(\frac{1}{9.81}\ kg/N\right) * \frac{1}{0.3048^3\ m^3/ft^3}$$

$$= 8326.72\ kg/m^3$$

THEREFORE: FOR $g = 9.81\ kg/N$, $\rho = 8326.72\ kg/m^3$

FOR $g = 10\ kg/N$, $\rho = 8168.51\ kg/m^3$

PROBLEM 1-17

GIVEN: EQ 1-2 $F = \frac{G M_1 M_2}{R^2}$

REQUIRED: EQ 1-2 DIMENSIONALLY HOMOGENEOUS

GRAVITATIONAL FORCE: $M_1 = M_2 = 150^{KG}$

$RADIUS = 275^{MM}$

$R = 2 * RADIUS = 0.55^{M}$

FORCE UNIT

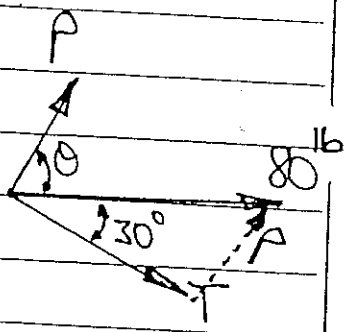
$$F = \frac{G M_1 M_2}{R^2} = \left(\frac{M^3}{KG * S^2}\right)\left(\frac{KG * KG}{M * M}\right) = \frac{KG * \frac{M}{S^2}}{} = N$$

$$F = 66.73 * 10^{-12} * \frac{(150 * 150)}{0.55^2} = 4.96 * 10^{-6} N = 4.96 \mu N = F$$

PROBLEM 2-26

GIVEN: RESULTANT FORCE ON BOAT = 80 lb
ANGLES θ & 30° TO P & T

REQUIRED: MAGNITUDES OF T & P FOR MINIMUM P



BY INSPECTION, $\theta = 60°$

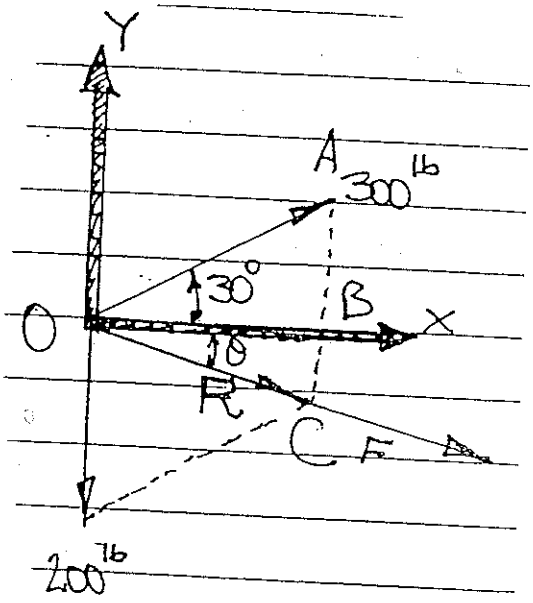
$\cos 30 = \frac{T}{80} \rightarrow \underline{T = 69.28 \text{ lb}}$

$\sin 30 = \frac{P}{80} \rightarrow \underline{P = 40.00 \text{ lb}}$

PROBLEM 2-29

GIVEN: RESULTANT = 500 lb
ANGLES θ & 30° TO F & 300 lb

REQUIRED: θ FOR MINIMUM F



$OB = OA\cos(30) = 300\cos(30) = 259.81^{lb}$

$AB = OA\sin(30) = 300\sin(30) = 150.00^{lb}$

$BC = AC - AB = 200 - 150 = 50.00^{lb}$

$OC = \frac{OB}{\cos(\theta)}$, $\theta = \tan^{-1}\frac{BC}{OB} = \tan^{-1}\left(\frac{50}{259.81}\right)$

$OC = R = \frac{259.81}{\cos(10.89)} = 264.58^{lb}$ $\quad 10.89° = \theta$

$F = 500 - R = 235.42^{lb} = F$