1-29

(a) $\rho(z) = a + bz + cz^2$ where $z = r - r_0$

where $r_0 = 6377$ km

using curve fit program

$a = 1.20252$

$b = -0.101674$

$c = 0.0022375$

At $z = 7$ km, ρ from equation above $= 0.60$ kg/m^3

(b) $m = \int_V \rho dV = \int_0^h (a+bz+cz^2)(4\pi)(r_0+z)^2 dz$

$= (4\pi)\int_0^h (a+bz+cz^2)(r_0^2 + 2r_0 z + z^2) dz$

Integrating and substituting

$M = 5.092 \times 10^{18}$ kg, (Note: 10^9 unit Conversion used)

1-50

$P_1 - P_{atm} = g(\rho_{Hg} h_3 - \rho_{H_2O} h_1 - \rho_{oil} h_2)$

$P_{gage} = P_1 - P_{atm}$

$g = 9.81$ m/s^2

$\rho_{Hg} = 13{,}600$ kg/m^3

$h_1 = 0.2$ m

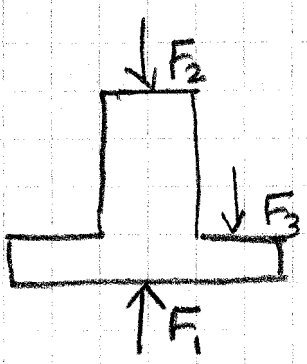
$h_2 = 0.3$ m

$h_3 = 0.46$ m

$\rho_{H_2O} = 1000$ kg/m^3

$P_{gage} = 56.9$ kPa

1-55



Force Balance

$F_3 = F_1 - F_2$

$F_1 = P_1 A_1$, $F_2 = P_2 A_2$

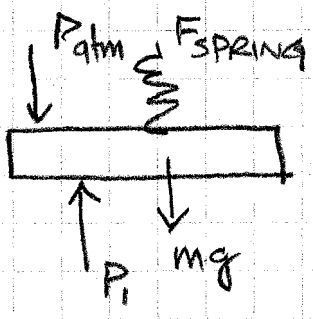
$F_3 = P_3 (A_1 - A_2) = P_3 (A_3)$

Substituting Values $P_3 = \frac{432 lbf}{3.927 in^2} = 110 psia$

1-57 908 kPA

substitute values in equations from 1-55

1-66



Force balance

$PA = P_{atm} A + W + F_{spring}$

123.4 kPa

1-74 $P = \rho_{blood} h_{blood} = \rho_{Hg} h_{Hg}$

$h_{blood} = \frac{\rho_{Hg}}{\rho_{blood}} h_{Hg} = 1.55 M$

1-94 similar to Problem 1-55 & 1-66

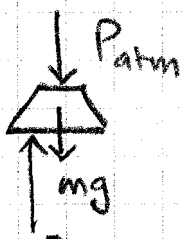
$F_5 + F_2 + F_3 = F_1$

$kx + P_2 A_2 + P_3 (A_1 - A_2) = P_1 A_1$ $= 1.72 cm$

1-88 Two roots

$x=0 \rightarrow 0.06\ldots$ $x=2 \rightarrow 2.063$

1-116



$W = P_{gage} A$

$m = \frac{W}{g} = 0.0408\ kg$

1-125 $P = \rho g \Delta h$

Plot P vs. I and estimate the slope & Intercept

$P = 13.00 I - 51.00$

For $I = 10\ mA$ $\underline{P = 79.0\ kPa}$