

AERO 215

HW 1 Hand Calcs

1) $7500 \text{ ft} = 2286 \text{ m}$ or 2.286 km

T $288.16 + (-0.0065)(2286 - 0) = 273.3 \text{ K} = \text{Temp}$

P $101.325 \left(\frac{273.3}{288.16} \right)^{\frac{-9.81}{-0.0065 \cdot 287.038}} = 76.7 \text{ kPa} = \text{Pressure}$

D $1.225 \left(\frac{273.3}{288.16} \right)^{\frac{-9.81}{-0.0065 \cdot 287.038} + 1} = .977 \text{ kg/m}^3$

2) $33,000 \text{ ft} = 10,058.4 \text{ m}$

T $288.16 + (-0.0065)(10,058.4 - 0) = 222.78 \text{ K} = \text{Temp}$

P $101.325 \left(\frac{222.78}{288.16} \right)^{\frac{-9.81}{-0.0065 \cdot 287.038}} = 26.19 \text{ kPa} = \text{Pressure}$

D $1.225 \left(\frac{222.78}{288.16} \right)^{\frac{-9.81}{-0.0065 \cdot 287.038} + 1} = .409 \text{ kg/m}^3$

3) $42,000 \text{ ft}$ or $12,801.6 \text{ m}$

T $216.66 + 0(12,801.6 - 11,000) = 216.66 \text{ K} = \text{Temp}$

P $22.62 e^{\left(\frac{-9.81}{287.038 \cdot 216.66} \cdot (12801.6 - 11,000) \right)} = 17.026 \text{ kPa} = \text{Pressure}$

D $.364 e^{\left(\frac{-9.81}{287.038 \cdot 216.66} \cdot (12801.6 - 11,000) \right)} = .274 \text{ kg/m}^3$

4) $80,000 \text{ ft}$ or $24,384 \text{ m}$

T $216.66 + 0(24,384 - 11,000) = 216.66 \text{ K} = \text{Temp}$

P $22.62 e^{\left(\frac{-9.81}{287.038 \cdot 216.66} \cdot (24384 - 11,000) \right)} = 2.79 \text{ kPa} = \text{Pressure}$

D $.364 e^{\left(\frac{-9.81}{287.038 \cdot 216.66} \cdot (24384 - 11,000) \right)} = .044 \text{ kg/m}^3 = \text{Density}$