**NAME: _____ SECTION _____**

# Atmospheric Sciences 101 Winter 2015
# Homework #6 (Due Thursday, 5 March 2015)

**1. Forces affecting air flow**

**Below is an air parcel in between two 500mb heights lines.**

a. **Carefully** draw arrows indicating the direction and relative strength of the pressure gradient force and Coriolis force. Use the length of the arrows to indicate relative strength, and assume we are in the northern hemisphere. Then, Draw a third arrow showing the wind direction. Label all arrows. [1.5]

_____ 5600m

_____ 5640m

b. What would happen to the wind speed if the height lines from part (a) were closer together? (increase, decrease, or no change) [0.5]

**Below is an air parcel in between two isobars at the surface.**

**Carefully** draw arrows indicating the direction and relative strength of the pressure gradient force, Coriolis force and friction (northern hemisphere). Then draw an arrow indicating the wind direction, as above. Label all arrows. [2]

_____ 1016mb

_____ 992mb

**2. Atmospheric Pressure. Consider two continental (non-coastal) weather stations, one located in central Alaska (cold) and one located in southern Texas (warm). Both stations are at the same elevation, approximately 400m above sea level.**

a. If the surface pressure at both locations is 970mb, how do the number of air molecules in a column above each station compare? (Assume each column is 1 m × 1 m wide). [0.5]

b. In which column is the air most likely to have a higher density? Briefly explain. [1]

c. Above which station would you expect the height of the 500 mb pressure surface to be higher? [1]

**3. Winds and Air Flow**

a. For air in geostrophic balance, the winds blow parallel to the height contours on a pressure surface. Name the two forces that are involved in geostrophic balance. [1]

b. Imagine a surface low pressure centre in the Northern Hemisphere. What additional force affects the winds? Does this change the direction of the winds? If so, what direction do the winds blow? [1.5]

c. Suppose the rate of rotation of the Earth increased and the winds remained in geostrophic balance.
   i. If the pressure gradient did not change, **how** would the strength of the forces from part (a) be different? [0.5]
   ii. Would the wind speed or direction change? [0.5]