# PH202 Recitation 6

Thermo Part 3 and Fluids

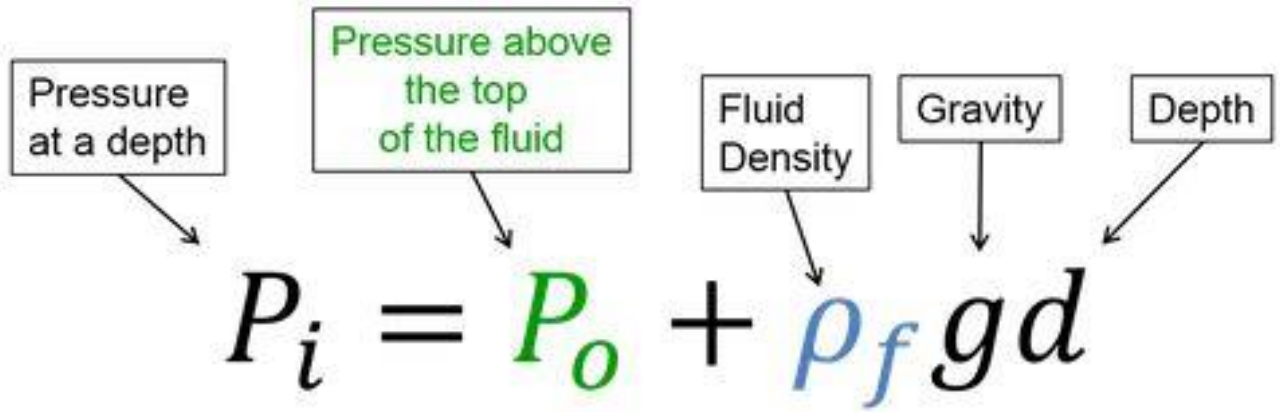
# Warm-Up 1: 1 minute

- Say the equation in words

$$P_i = P_o + \rho_f g d$$

# Warm-Up 1 Solution

## Pressure at a Depth



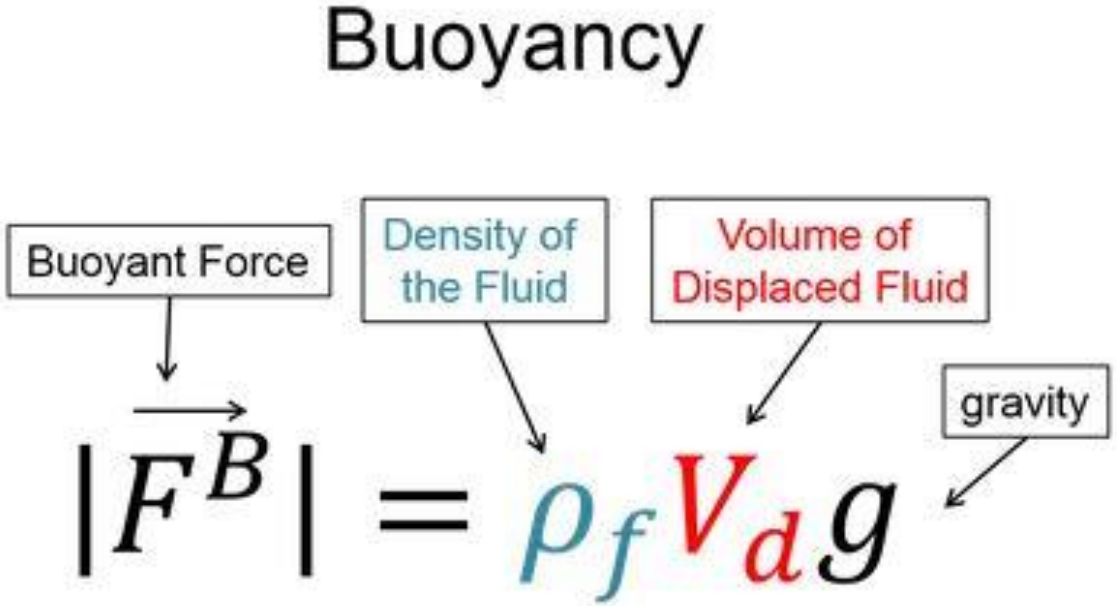

*In words:* The **pressure at a depth** is equal to the **pressure at the top of the fluid,** plus the product of the **density of the fluid**, **gravity**, and the **depth** below the top of the fluid.

# Warm-Up 2: 1 minute

- Say the equation in words

$$|\vec{F^B}| = \rho_f V_d g$$

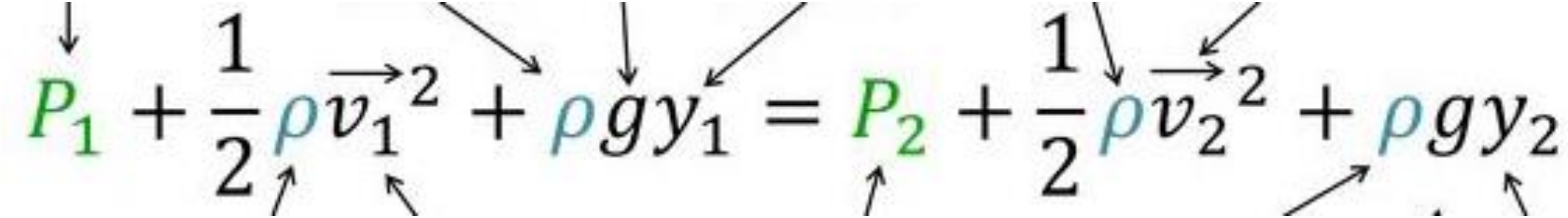
# Warm-Up 2 Solution



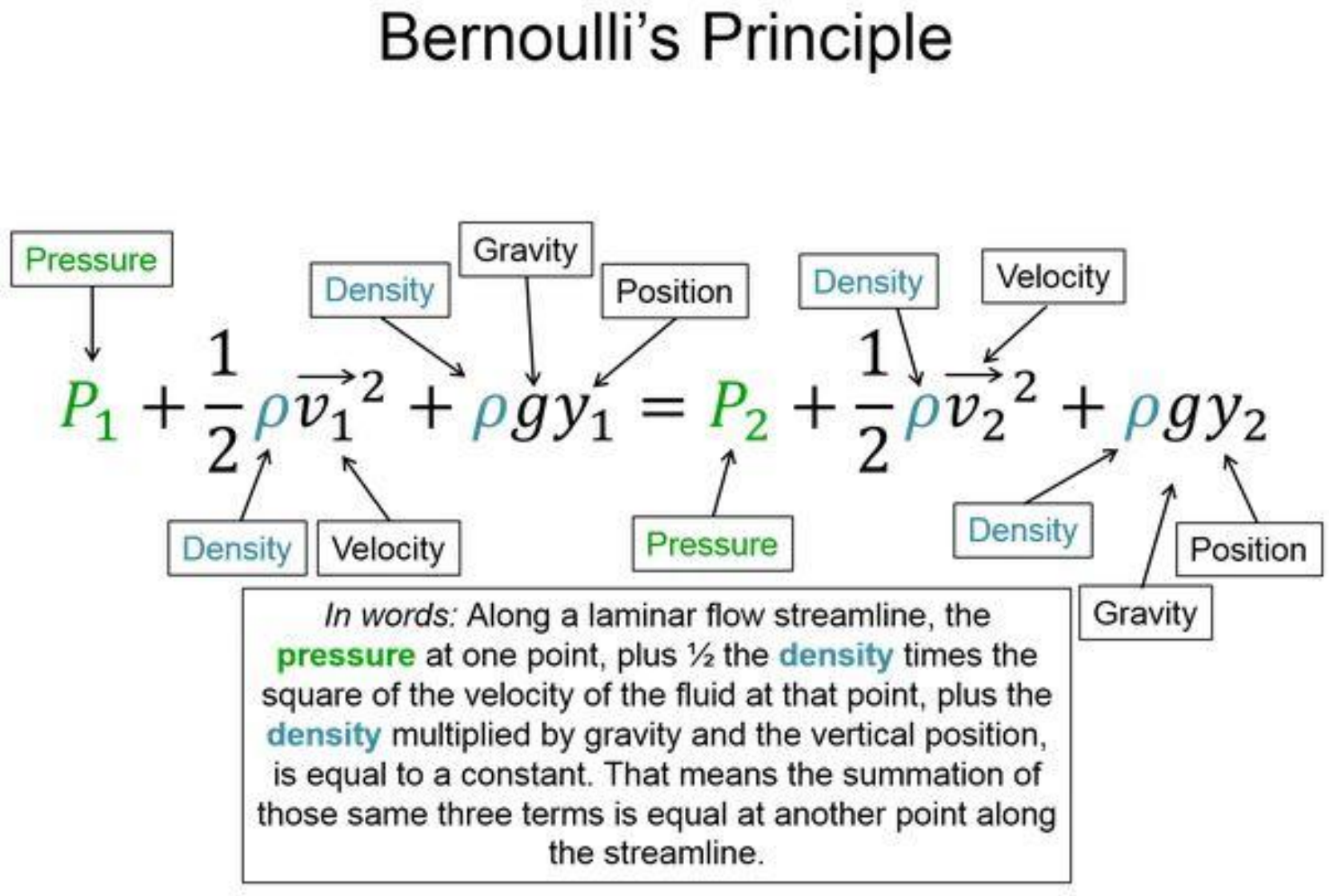

*In words:* The **buoyant force** is equal to the product of the **density** of the fluid, the **volume of displaced fluid**, and **gravity**.

# Warm-Up 3: 1 minute

- Say the equation in words



# Warm-Up 3 Solution



# Question 1: 7 minutes

A. Calculate the depth of water needed to have a pressure of 1 atm.
B. What if it were mercury instead of water (density of mercury is 13,690kg/$m^3$)?

# Question 2: 7 minutes

- Most IV infusions work using gravity.  What is the minimum height that an IV bag must be placed above an entry point for the IV fluid to flow?  Assume the bag is collapsible and that blood has a pressure of 18mm Hg and there is 133Pa per 1mm Hg.

# Question 3: 7 minutes

- A barber raises a customer in a hydraulic chair. The barber uses a force of 150N on a piston that has an area of $0.01m^2$. The chair is attached to a piston of area of $0.1m^2$. If the mass of the chair is 5kg, what is the mass of the customer?

# Question 4: 7 minutes

- A fisherman with mass 75kg falls asleep on a chair (5kg). The chair has 4 legs on the ground with each leg having a radius of 2cm. What is the pressure exerted on the ground?

# Question 5: 7 minutes

- There is 1 mol of a monatomic ideal gas that is in a 4-step cycle. All processes are either isobaric or isochoric. The gas starts at a pressure of 100,000Pa and volume of $0.020m^3$. The pressure is then doubled isochorically. After that, the volume is then tripled isobarically. Then, the pressure is halved isochorically. Finally, the volume is then cut in to a third its value to get back to the original state.

A. Sketch the PV diagram
B. Determine the temperature at each point
C. Calculate W, Q, and ΔE for each step of the cycle and the whole cycle