Hydrostatics

Opening in the boat:
Calculate the force $F$ needed for covering by the plug (from the inner site) an opening in the boat. The opening is in depth $h = 3 \text{ m}$ under the sea level, the area of the plug is $A = 5 \text{ m}^2$, gravity acceleration assume as $g = 10 \text{ m s}^{-2}$ and density of water take equal to $\rho_w = 1000 \text{ kg m}^{-3}$.

$[15 \text{ kN}]$

Press machine:
Press machine is made from two connected tubes with two pistons, inside with incompressible fluid (in real case is usually using the hydraulic oil). Lets’ displacements of pistons to be $l_1 = 25 \text{ cm}$ and $l_2 = 5 \text{ cm}$ respectively and the force acting to the narrower piston is $F_1 = 200 \text{ N}$. Calculate force working to the wider piston $F_2$.

$[1 \text{ kN}]$

Mercury in the tube:
Inside an U-shape tube is mercury and in one of two tubes is the column of water above the mercury, see the picture. Difference between the mercury’s levels is $\Delta h = 2 \text{ cm}$. Density of water is $\rho_w = 1000 \text{ kg/m}^3$ and density of mercury is $\rho_m = 13600 \text{ kg/m}^3$. Gravity acceleration lets’ assume as $g = 10 \text{ m s}^{-2}$. What is the height of the column of water $h_w$?

$[27.2 \text{ cm}]$