1) A water bed for sale has dimensions of \(1.83 \text{ m} \times 2.13 \text{ m} \times 0.229 \text{ m}\). The floor of the bedroom will tolerate an additional weight of no more than 6660 N. Find the weight of the water bed and determine whether the bed should be purchased.

2) A glass bottle of soda is sealed with a screw cap. The absolute pressure of the carbon dioxide inside the bottle is \(1.80 \times 10^5 \text{ Pa}\). Assuming that the top and bottom surfaces of the cap each have an area of \(4.10 \times 10^{-4} \text{ m}^2\), obtain the magnitude of the force that the screw threads exert of the cap in order to keep it on the bottle. The air pressure outside the bottle is one atmosphere.

3) The Mariana trench is located in the floor of the Pacific Ocean at a depth of about 11000m below the surface of the water. The density of sea water is 1025 kg/m\(^2\). a) if an underwater vehicle were to explore such a depth, what force would the water exert of the vehicle’s observation window (radius = 0.10 m)? b) For comparison, determine the weight of a jetliner whose mass is \(1.2 \times 10^4 \text{ kg}\).

4) A dump truck uses a hydraulic cylinder, as the drawing illustrates. When activated by the operator, a pump injects hydraulic oil into the cylinder with an absolute pressure of \(3.54 \times 10^6 \text{ Pa}\) and drives the output plunger, with a radius of 0.15m. Assuming that the plunger remains perpendicular to the floor of the load bed, find the torque that the plunger creates about the axis identified in the drawing.

\[
\begin{align*}
1) \quad & M = 8 \cdot V = (1000 \text{ kg/m}^3)(1.83 \times 2.13 \times 0.229) \text{ m}^3 = 893 \text{ kg} \\
& W = M \cdot g = (893 \text{ kg})(9.8 \text{ m/s}^2) = 8750 \text{ N} \\
& \text{Since this is greater than 6660 N it would be a bad idea to purchase it.}
\end{align*}
\]

\[
\begin{align*}
2) \quad & P_{\text{out}} = 1.013 \times 10^5 \\
& P_{\text{out}} \cdot A = F_{\text{out}} \\
& F_{\text{out}} = F_{\text{in}} - F_{\text{out}} \quad \therefore F_{\text{out}} = (P_{\text{in}} - P_{\text{out}}) A \\
& F_{\text{in}} = (1.8 \times 10^5 - 1.013 \times 10^5) \cdot 4.1 \times 10^{-4} \text{ N} \\
& F_{\text{out}} = 32.3 \text{ N}
\end{align*}
\]
3) \[ P = \rho gh = (2025 \text{ kg/m}^3)(9.8 \text{ m/s}^2)(11000 \text{ m}) \]
\[ = 1.1 \times 10^8 \text{ Pa} \]

\[ F = PA = (1.1 \times 10^8 \text{ Pa}) \pi (0.1 \text{ m})^2 = 3.47 \times 10^6 \text{ N} \]

Weight of Plane: \( (1.2 \times 10^5 \text{ kg}) (9.8 \text{ m/s}^2) = 1.176 \times 10^6 \text{ N} \)

Force on window = 3 x weight of Plane

4) \[ F = PA \]
\[ 3.5 \text{ m} = l \]

\[ \tau = FL \]
\[ = (3.47 \times 10^6 \text{ Pa}) \pi (0.15 \text{ m})^2 (3.5 \text{ m}) \]
\[ = 8.76 \times 10^5 \text{ N.m} \]