1. A reservoir is 40 feet tall. Find the pressure at the bottom of the reservoir.

   $40\text{ft} \times 0.433\text{psi/ft} = 17.3\text{psi}$

2. Find the height of water in a tank if the pressure at the bottom of the tank is 12 psi.

   $12\text{psi} \div 0.433\text{psi/ft} = 27.7\text{ft}$

3. If a pump discharge pressure gauge read 10 psi, the height of the water corresponding to this pressure would be:

$$10\ \ psi \times \frac{2.31\ \ ft}{psi} = 23.1\ \ ft$$

4. A water tank is filled to depth of 22 feet. What is the psi at the bottom of the tank?

   Solution:

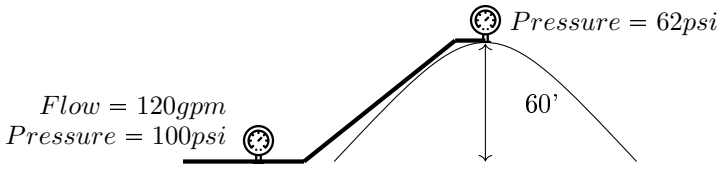
   $22\ \cancel{ft} * \frac{0.433psi}{\cancel{ft\ head}} = \boxed{9.5\text{ psi}}$

5. The static pressure in a water main is 85 psi. What elevation of water is needed to provide that kind of pressure?

   Solution:

   $85\ \cancel{psi} * \frac{ft\ \ head}{0.433\cancel{psi}} = \boxed{196.3\text{ feet}}$

6. The pressure at the top of the hill is 62 psi. The pressure at the bottom of the hill, 60 feet below, is 100 psi. The water is flowing uphill at 120 gpm. What is the friction loss, in feet, in the pipe?



   Total headloss = Headloss due to elevation gain + Headloss due to friction

   $\Longrightarrow$ Headloss due to friction = Total headloss - Headloss due to elevation gain

   Total headloss = $(100 - 62)\ \cancel{psi} * \frac{ft\ \ head}{0.433\cancel{psi}} = 87.8ft$

   Headloss due to elevation gain = $60\ \ ft$

   $\Longrightarrow$ Headloss due to friction = $87.8 - 60 = \boxed{27.8\ \ ft}$

7. Find the force on a 12-inch valve if the water pressure within the line is 60 psi. Express your answer in tons.

   Force = Pressure $\times$ Area

   $\Longrightarrow\ 60\ \frac{\text{lbs}}{\text{in}^2} * 0.785 * (12\text{in})^2 * \frac{1\text{ton}}{2000\text{lbs}} = \boxed{3.39\ \text{tons}}$

8. A water tank is 15 feet deep and 30 feet in diameter. What is the force exerted on a 6-inch valve at the bottom of the tank?

   Force = Pressure × Area

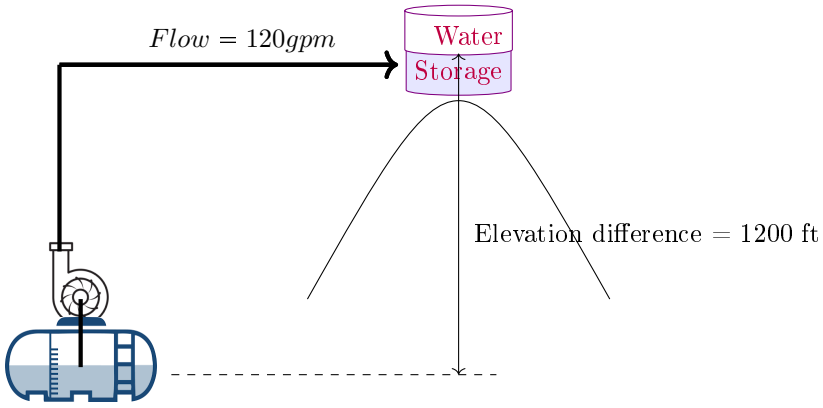
   $$\implies 15 \text{ ft} * \frac{0.433 \text{ psi}}{\text{ft}} * 0.785 * (6\text{in})^2 = \boxed{183 \text{ lbs}}$$

9. The efficiency of a well pump is determined to be 75%. The efficiency of the motor is estimated at 94%. What is the efficiency of the well?

   Solution:

   $$Well\ \ efficiency = \eta_m * \eta_p \implies 0.94 \times 0.75 = 0.705 \times 100 = \boxed{71\%}$$

10. Water is being pumped from a reservoir to a storage tank on a hill. The elevation difference between water levels is 1200 feet. Find the pump size (in Hp) required to fill the tank at a rate of 120 gpm.



   Solution:

   water Hp = flow * head

   $$120GPM * 1,200ft * \frac{Hp}{3,960GPM - ft} = \boxed{Water\ \ Hp = 36.4Hp}$$

11. If a pump is operating at 2,200 gpm and 60 feet of head, what is the water horsepower? If the pump efficiency is 71%, what is the brake horsepower?

   Solution:

   water Hp = flow * head

   $$2,200GPM * 60ft * \frac{Hp}{3,960GPM - ft} = \boxed{Water\ \ Hp = 33.3Hp}$$

   pump Hp = brake Hp * pump efficiency

   $$brake\ \ Hp = \frac{33.3}{0.71} = \boxed{Brake\ \ Hp = 47Hp}$$