

36.55 1000gpm of water is pumped up an incline of 200ft. The suction pressure is 50psig and the pressure at the extent of the discharge piping is 250psig. The head loss through the discharge piping is 40ft, and losses through the suction piping are negligible. The suction and discharge piping diameters are 12in and 8in, respectively. How much horsepower is supplied by the pump?

- A. 111hp
- B. 132hp
- C. 177hp
- D. 410hp

Use the modified **Bernoulli Equation** for head added by a pump.

$$h_A = \frac{P_2 - P_1}{\gamma} + \frac{v_2^2 - v_1^2}{2g} + z_2 - z_1 + h_f$$

Neglect the velocity term. Use the rule of thumb conversion factor to convert the differential static pressure from *psi* to *ft*.

$$h_A = (250psig - 50psig) \left(2.31 \frac{ft}{psi} \right) + (200ft) + 40ft = 702ft$$

Calculate the **Water Horsepower** added by the pump.

$$whp = \frac{Q\Delta h}{3960}$$

$$whp = \frac{(1000)(702)}{3960} = 177hp$$

Answer C