1. A cone with height 12 ft and radius 4 ft, pointing downward, is filled with water to a depth of 9 ft. Find the work required to pump all the water out over the top. (Water weighs 62.4 lb/ft$^3$).

2. A leaky 10-kg bucket is lifted from the ground to a height of 12 m at a constant speed with a rope that weighs 0.8 kg/m. Initially the bucket contains 36 kg of water, but the water leaks at a constant rate and finishes draining just as the bucket reaches the 12 m level. How much work is done?

3. A dam has the shape of the trapezoid shown in the figure below. Find the force on the dam due to hydrostatic pressure if the water level is 4 m from the top of the dam.

![Diagram of a dam with dimensions 50 m in width and 20 m in height.]

4. Find the hydrostatic force on one end of a cylindrical drum with radius 3 ft if the drum is submerged in water 10 ft deep.

![Diagram of a cylindrical drum with dimensions 3 ft in radius and 10 ft in height.]

5. Test the series for convergence or divergence.

   (i) $\sum_{n=1}^{\infty} \frac{5^n}{1 + 7^n}$
   (ii) $\sum_{n=1}^{\infty} \frac{n}{(7 + n^2)^3}$
   (iii) $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^2 + 2n + 1}$
   (iv) $\sum_{n=1}^{\infty} \frac{(2n)!}{n!(n+1)!}$

   (v) $\sum_{n=1}^{\infty} \frac{n^2}{5n^2 + 4}$
   (vi) $\sum_{n=1}^{\infty} \frac{1}{ne^n}$
   (vii) $\sum_{n=1}^{\infty} \frac{n \sin n}{n^3 + 1}$
   (viii) $\sum_{n=1}^{\infty} \frac{1}{n(\ln n)^2}$
6. Determine whether the series \( \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{\sqrt[4]{n}} \) is absolutely convergent, conditionally convergent, or divergent.

7. Find the radius of convergence and the interval of convergence for the power series \( \sum_{n=1}^{\infty} \frac{5^n(x - 2)^n}{8n^7} \).