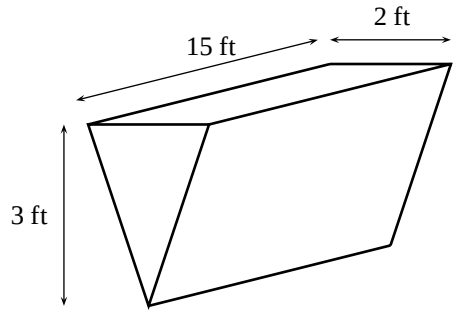
**Instructions.** Attempt all questions. Answers must be justified in order to gain full credit. Calculators are not permitted.

Water weighs 62.4 lb / ft$^3$.

1. (10 points) Water in a cylinder of height 10 ft and radius 4 ft is to be pumped out. Find the work required if the tank is full of water and the water must be pumped to a height 5 ft above the top of the tank.

2. (7 points) The trough in the figure below is full of water. Find the force of water on a triangular end.




3. (8 points) Use the integral test to decided if the series $\sum_{n=1}^{\infty} \frac{\ln n}{n}$ converges.

4. (5 points) Use the comparison test to determine whether the series $\sum_{n=1}^{\infty} \frac{n^2}{n^3 - 5}$ converges.

5. (5 points) Use the alternating series test to show that the series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{\sqrt{n}}$ converges.

6. (10 points) Find the radius of convergence and the interval of convergence for the power series $\sum_{n=1}^{\infty} \frac{n^3(x-1)^n}{7^{n+1}}$.

7. (5 points) Find the degree 4 Talyor polynomial for $f(x) = \sin(2x)$ about $x = \pi/4$.