

## 2.5B Hydrostatic Force in class

③  $y = \frac{1}{2}x^2$   $y = 12\text{ ft}$  filled 8 ft gas  $p = 42 \frac{\text{lb}}{\text{ft}^3}$

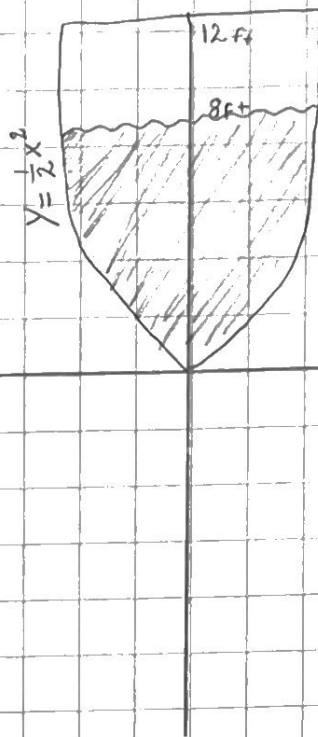
$$\text{Pressure} = p \cdot g \cdot \text{depth}$$

$$\text{depth} = 8 - y$$

$$P = (42)(8 - y)$$

$$\text{Force} = P \cdot A$$

Boundary  
[0, 8]



in terms of  $y$   $= y = \frac{x^2}{2} \rightarrow \sqrt{2y} = \sqrt{x^2} \rightarrow \sqrt{2y}$

↓  
in terms of  $y$   $= \sqrt{2y}$  ← half, needs to be doubled

$$\int_0^8 (42)(8 - y)(2\sqrt{2y}) dy \rightarrow \int_0^8 (42)(8 - y)(2\sqrt{2y}) dy$$

$$84 \int_0^8 (12 - y)(\sqrt{2y}) dy \rightarrow 84 \int_0^8 8\sqrt{2y} - y\sqrt{2y} dy$$

$$84 \int_0^8 8 \cdot 2^{\frac{1}{2}} (y)^{\frac{1}{2}} - \sqrt{2} y^{\frac{3}{2}} dy \rightarrow 84 \left( \left( \frac{2}{3} \right) 8 \cdot 2^{\frac{1}{2}} (y)^{\frac{3}{2}} - \left( \frac{2}{5} \right) \sqrt{2} (y)^{\frac{5}{2}} \right) \Big|_0^8$$

$$84 \left( \left( \frac{2}{3} \right) 8 \cdot 2^{\frac{1}{2}} \cdot 8^{\frac{3}{2}} - \frac{2}{5} \sqrt{2} 8^{\frac{5}{2}} \right) - (0) = \boxed{5734.4 \text{ lb}}$$