4. [15 points] For each of the following, circle ALL that apply. There may be more than one correct answer for each part. You do not need to show any work for any part of this question.

  a. [5 points] Suppose $P(t)$ is a **cumulative distribution function** (cdf) satisfying $P(0.5) = 0.4$. Which of the following MUST be true?

$$\lim_{t \to \infty} P(t) = 1.$$ 0.4 is a median t-value for the distribution.

$$P(0.4) \leq 0.5.$$ The mean t-value of the distribution is 0.4.

NONE OF THESE

  b. [5 points] A building is flooded, completely filled with water. The interior of the building is in the shape of a cube with side length 4 meters. To restore it, water is pumped out of the building to a temporary reservoir that lies **1 meter above the top of the building**. The density of water is 1000 kg per cubic meter. The acceleration due to gravity is g, where $g = 9.8\,\text{m/s}^2$. Which of the following are equal to the work done, in Joules, in this pumping process?

$$\int_0^4 16 \cdot h \cdot 1000 \cdot 9.8\, dh$$ $$\int_0^4 16 \cdot (1+h) \cdot 1000 \cdot 9.8\, dh$$

$$\int_0^4 16 \cdot (5-h) \cdot 1000 \cdot 9.8\, dh$$ $$\int_0^5 16 \cdot h \cdot 1000 \cdot 9.8\, dh$$

NONE OF THESE

  c. [5 points] The integral $\int_2^\infty \dfrac{x^{2/3}}{x + x^2}\, dx$ ...

Diverges by the comparison test because $\frac{x^{2/3}}{x+x^2} \geq \frac{1}{x^{1/3}}$ for $x \geq 2$.

Converges by the comparison test because $\frac{x^{2/3}}{x+x^2} \leq \frac{1}{x^{4/3}}$ for $x \geq 2$.

Diverges because $\frac{x^{2/3}}{x+x^2} > 0$ for $x \geq 2$.

Converges because $\lim\limits_{x \to \infty} \frac{x^{2/3}}{x+x^2} = 0$.

NONE OF THESE