

Quiz 8 will cover the following material: (all handouts posted on the web site so far)

1. All material for Quizzes 1-7 and Exam 1
2. Computing center of mass.
3. State the axioms of real numbers.

Sample Quiz 8

1. Use integration to compute the volume of the torus we obtain when we rotate the circle $x^2 + y^2 = r$ about the line $x = R$ where $R > r$.
2. A tank, shaped like a sphere with radius R (measured in meters) is full of water and is buried so that its center is h meters below the ground. Compute the work that is required to pump out all the water from the tank. Assume the following: at all times, the pipe is leveled at the surface of the water, and we are pumping out the water to the top of the tank. The density of water is $1000 \frac{\text{kg}}{\text{m}^3}$ and the gravitational acceleration is $g \approx 10 \frac{\text{m}}{\text{s}^2}$.
3. Compute the center of mass of the unit (upper) semicircle centered at the origin. Assume a uniform density.
4. Compute the center of mass of R where R is the region bounded by $y = x^3$ and $y = \sqrt{x}$ between $x = 0$ and $x = 1$.
 - a) Assume a uniform density.
 - b) Assume a density of $\delta(x) = \sqrt{x}$
5. State the completeness property of real numbers.

Answers

- 1.) $V = 2\pi^2 Rr^2$ 2.) $\frac{40\,000}{3}\pi R^3 h$ (J) 3.) $\left(0, \frac{4}{3\pi}\right)$ 4.) a) $\left(\frac{12}{25}, \frac{3}{7}\right)$ b) $\left(\frac{6}{11}, \frac{12}{25}\right)$
- 5.) Every non-empty subset of \mathbb{R} that is bounded above has a least upper bound.