

All 7 problems are worth 14 points each. Remember: 5 points for setting the problem up correctly, 5 points for doing the calculus correctly, and the last 4 points for finding each exact answer (like $\sqrt{11}$) instead of a decimal approximation (like 3.31662479)

1. Find the exact area of the region that lies between the graphs of the following equations

$$y_1 = 5 - x^2$$

$$y_2 = x^2$$

2. A swimming pool viewed from above has an outline given by $y = \pm(3 + x)$ for $0 \leq x \leq \sqrt{3}$. The depth is $5 + x$ (all measurements in feet). Compute the *exact* volume.

3. Find the exact volume when the region bounded by

$$y_1 = 5 - x^2$$

$$y_2 = x^2$$

is rotated around the line $y = 6$.

4. Compute the exact length of the arc $y = \frac{1}{4}x^2 - \frac{1}{2}\ln x$, $1 \leq x \leq 3$.
5. An object is launched from the ground at an angle of 30° with an initial speed of 48 ft/sec. Find the *exact* value of the horizontal range.
6. Two workers share the job of digging a rectangular hole 8 feet deep. Other workers will clear away the dirt from the hole. Assuming a constant density of the dirt, how deep does the first worker need to dig to do half of the work? (The correct answer is not 4 feet.)
7. Find the exact value of the median of the random variable with the pdf given as $f(x) = 4x^3$, $0 \leq x \leq 1$.