

Quiz # 6 — 03/05/15

Answer all questions in a clear and concise manner. Answers that are without explanations or are poorly presented may not receive full credit.

1. Use the **Shell Method** (not Disk) to find the volume of the solid formed by rotating the region between $y = x^2 + 1$ and $y = 2$ about the y -axis.

(a) What integral describes the volume of this solid?

The points of intersection satisfy $2 = x^2 + 1$ ($x = \pm 1$), so each shell has radius in the interval $[0, 1]$.

$$\int_0^1 2\pi x [2 - (x^2 + 1)] dx$$

(b) Evaluate the integral you found in part (a):

$$\begin{aligned} \int_0^1 2\pi x [2 - (x^2 + 1)] dx &= 2\pi \int_0^1 [-x^3 + x] dx \\ &= 2\pi \left[-\frac{x^4}{4} + \frac{x^2}{2} \right]_0^1 \\ &= 2\pi \left(-\frac{1}{4} + \frac{1}{2} \right) \\ &= \frac{\pi}{2} \end{aligned}$$

Award 1 point for setting up the correct integral, 1 point for the correct integration, and 1 point for the correct answer.