MA 114 Quiz 7 March 24, 2022

Answer all questions and show your work. Unsupported answers may receive *no credit*. You may not use a calculator on this quiz. Allow 15 minutes for the quiz.

Name: _____ Section: _____

1. (5 points) Let S be the solid whose base is the circle $x^2 + y^2 = 9$ and whose vertical cross sections perpendicular to the x-axis are squares. Set up but *do not evaluate* the integral that calculates the volume of S.

   Solution: The side length of the square is $2\sqrt{9-x^2}$. So the area of the square is

   $$A(x) = 4(9 - x^2)$$

   Integrating the cross-sectional area of the square along the x-axis from -3 to 3, we obtain the following integral

   $$V = 4\int_{-3}^{3} A(x)dx = 4\int_{-3}^{3}(9 - x^2)dx$$

2. (5 points) Let R be the region bounded by the functions $y = \sqrt{x}$ and $y = \frac{1}{2}x$. Set up but *do not evaluate* the integral that calculates the volume of a solid given by rotating R about the x-axis using the washer method.

   Solution: Note that the outer radius is $\sqrt{x}$ and the inner radius is $\frac{1}{2}x$. The points of intersection of these two curves are $x = 0$ and $x = 0$. Then the volume created by the rotation of the region between $\sqrt{x}$ and $\frac{1}{2}x$ about the x-axis is

   $$V = \pi\int_{0}^{4}\left((\sqrt{x})^2 - \left(\frac{1}{2}x\right)^2\right)dx$$