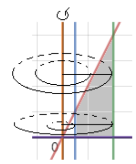
Eddie Price **Quiz 7 Solutions** **Spring 2018**

High score: 10; (nonzero) Low score: 1; Average score: 4.57

Problem 1 (4 Points). Set up an integral (or integrals) to find the volume of the solid obtained by revolving the region bounded by $y = 2x$, $x = 1$, $x = 4$, and $y = 0$ about the y-axis. You do not have to evaluate the integral(s).

Solution. We start with a sketch of the region (made in Desmos and MS Paint)

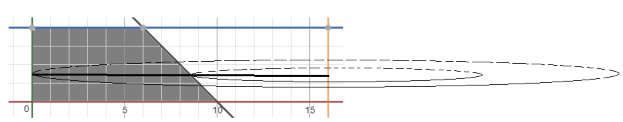


We can tell that we have to split this into two regions because the inner radius changes, depending on the y-value. Of course, everything should be in terms of y, so we get $x = \frac{1}{2}y$ as the equation of the line. We can see that from $y = 0$ until $y = 2$, the outer radius $R = 4$ and the inner radius $r = 1$. From $y = 2$ until $y = 8$, we have the outer radius $R = 4$ and the inner radius $r = \frac{1}{2}y$. So we get

$$\boxed{V = \int_0^2 \pi\left((4)^2 - (1)^2\right)\,dy + \int_2^8 \pi\left((4)^2 - \left(\frac{1}{2}y\right)^2\right)\,dy}$$

Problem 2 (5 points). Find the volume of the solid obtained by revolving the region bounded by $y = 10 - x$, $y = 0$, $y = 1$, and $x = 0$ about the line $x = 16$. Round to 2 decimal places.

Solution. We start with a sketch of the region (made in Desmos and MS Paint)



Since we're rotating about a line parallel to the y-axis, we need everything in terms of y. So the line is $x = 10 - y$. We can see from the sketch that the outer radius $R = 16 - 0 = 16$ and the inner radius $r = 16 - (10 - y) = 6 + y$. We can see from the sketch that y varies from 0 to 1.

$$V = \int_0^1 \pi\left((16)^2 - (6+y)^2\right)\,dy$$

$$= \pi\int_0^1 \left(-y^2 - 12y + 220\right)\,dy = \pi\left[-\frac{1}{3}y^3 - 6y^2 + 220y\right]_0^1$$

$$= \pi\left(-\frac{1}{3} - 6 + 220\right) \approx \boxed{213.67} \text{ units}^3$$

Common Mistakes

There's not much to say here. People either did things correctly or incorrectly.