

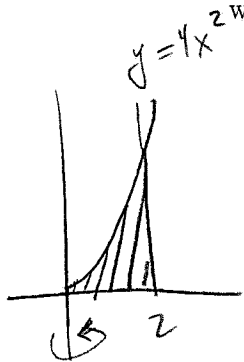
QUIZ 12 SOLUTIONS: LESSON 13
FEBRUARY 15, 2019

Write legibly, clearly indicate the question you are answering, and put a box around your final answer. If you do not clearly indicate the question numbers, I will take off points. Write as much work as you need to demonstrate to me that you understand the concepts involved. If you have any questions, raise your hand and I will come over to you.

1. [5 pts] Find the volume of the solid obtained by revolving the region enclosed by the curves

$$y = 4x^2, x = 2, \text{ and } y = 0$$

about the y -axis. Round your answer to the nearest hundredth.



About the y -axis implies we need to solve for x :

$$y = 4x^2$$

$$\Rightarrow \frac{y}{4} = x^2$$

$$\Rightarrow \sqrt{\frac{y}{4}} = x$$

Our bounds need to be y -values

So when $x = 2$:

$$y = 4(2)^2 = 16$$

We have a gap so this is the washer method:

Outer Radius: $x = 2$
 Inner Radius: $\sqrt{y/4}$

$$\text{Vol} = \pi \int_0^{16} [(2)^2 - (\sqrt{y/4})^2] dy$$

$$= \pi \int_0^{16} [4 - y/4] dy$$

$$= \pi [4y - y^2/8]_0^{16}$$

$$= \pi [4(16) - (16)^2/8]$$

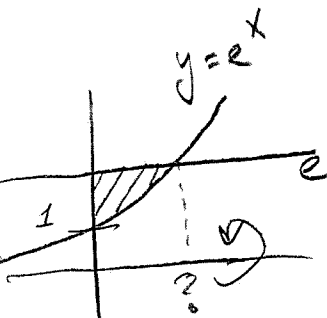
$$= \pi [32]$$

$$\approx \boxed{100.53}$$

2. [5 pts] Find the volume of the solid obtained by revolving the region enclosed by the curves

$$y = e^x, y = e, \text{ and } y = 0$$

about the x -axis. Round your answer to the nearest hundredth.



We need to use the Washer method.

Since this is about the x -axis, our bounds will be x -values

$$e^x = e$$

$$\Rightarrow \ln e^x = \ln e$$

$$x = 1$$

So, $0 \leq x \leq 1$

Outer Radius: $y = e$

Inner Radius: $y = e^x$

$$\text{Vol} = \pi \int_0^1 [e^2 - (e^x)^2] dx$$

$$= \pi \int_0^1 [e^2 - e^{2x}] dx$$

$$= \pi [e^2 x - \frac{1}{2} e^{2x}]_0^1$$

$$= \pi [e^2 - \frac{1}{2} e^2 - (0 - \frac{1}{2} e^0)]$$

$$= \pi [\frac{1}{2} e^2 + \frac{1}{2}]$$

$$\approx \boxed{13.18}$$

Note: $(x^a)^b = x^{ab}$ similarly $(e^a)^b = e^{ab}$
 So $(e^x)^2 = e^{2x}$ NOT e^{x^2}