Math 106, Spring 2024

Worksheet 11, Tuesday, April 30, 2024

Exponential Growth and Decay Answer the following. Justify. Simplify, and give full final answers. You can use Calculators on the final answers or leave them as solved.

For each problem, state the General Solution formula

1. A bacteria culture starts with 1000 bacteria. After two hours the population is 2500. Assume the culture grows at a rate proportional to its size.

- Find the population after 6 hours.
- When will the population equal 9000?

2. The Half-Life of Carbon-14 is 5730 years, meaning that after that many years, half of the original Carbon-14 material remains in the organic sample. Suppose there was originally 100 grams of Carbon-14, how much remains after 200 years?

Volumes of Revolution For all problems, make sure to Sketch both the bounded 2-D region and the 3-D solid. Also, Sketch one Approximating Rectangle on the 2-D sketch and then one Approximating Disk or Washer on the 3-D sketch.

Please write all Formulas clearly before substituting.

3. Consider the region bounded by $y = 1 - x^2$ and $y = 0$. Rotate this region about the x-axis. Compute the resulting Volume. Sketch.

4. Consider the region bounded by $y = x^2 + 3$ and $y = 0$ and then between $x = -1$ and $x = 1$. Rotate this region about the x-axis. Compute the resulting Volume. Sketch.

5. Consider the region bounded by $y = e^x$ and $y = x$ and between $x = 0$ and $x = 2$. Rotate this region about the horizontal line $y = -1$. **Set-Up but DO NOT COMPUTE** the integral that represents the resulting Volume. Sketch.

6. Consider the region bounded by $y = e^x + 1$ and $y = 3$ and the y-axis. Rotate this region about the horizontal line $y = -2$. **Set-Up but DO NOT COMPUTE** the integral that represents the resulting Volume. Sketch.

Turn in your own solutions into Gradescope before 11:59 pm today, Tuesday April 30

Finish all problems through number 5