Math 145 - Calculus I Name_____

Lab Rat - Day 39 [1]

A lab rat has a tumor and is treated with an experimental chemotherapy drug. Researchers determine that the rate of change of the size of the tumor in cm^3 per day is given by

$$r(t) = 0.0025e^{0.25t} - 0.1485e^{-0.15t}.$$

1. Plot $r(t)$ for $0 \leq t \leq 15$ days. As always be sure to label and include units and a scale on both axes.

2. Using your algebra skills, for what value of t is $r(t) = 0$? *(Laws of exponents will help here.)*

3. What is happening with the tumor at the time you found in question 2.?

[1] This example is based on problem 6.1.44 in our textbook.

4. Use substitution to evaluate $\int 0.0025e^{0.25t}\,dt$ and $\int 0.1485e^{-0.15t}\,dt$.

5. Now evaluate $\int_0^{10.2107} r(t)\,dt$ (don't forget the units).

6. What does your answer from 5. represent?

7. Suppose the rat's tumor is initially 1.5 cm^3 and treatment is given over 10.2107 days. What will be the tumor size after treatment? What do you think will happen to the tumor if the initial size is just 0.5 cm^3?

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8. Notice how the graph of $r(t)$ is positive after $t = 10.2107$. What does that mean for tumor growth when $r > 0$?

9. Determine the final tumor size if treatment is given over 14 days instead (assuming an initial size of 1.5 cm^3). How does this tumor size compare to treatment is given for just $t = 10.2107$ days?

10. Assuming that the tumor starts out at over 1 cm^3, estimate how many days will it take to return to its original size. *(Be creative here, this number cannot be computed exactly.)*