

Show all your work to ensure full credit

1. Determine all the solutions to the equations below. If there is more than one solution, separate them with commas.

a. $\log_3(2x + 1) + \log_3(x + 2) = 2$

b. $300e^{0.04t} = 5000$

c. $2^{4-2x} = 7^{3x+1}$

d. $3^{x^2-5x+6} = 9^{x-2}$

2. A loan of \$10,000 is made at 12.5% interest, compounded annually. Assuming no repayment is made, after how many years will the amount due reach \$150,000 or more? (Use a calculator if necessary.) Write the smallest possible whole number answer.

3. A sample from an old artifact found in an excavation to contain 15% of its original carbon-14. It is known that the half-life of carbon-14 is 5730 years. Estimate how old the artifact could be.

4. Solve the system of equations below. Explain what the solution means in terms of the graphs of the two curves in the system of equations. Give a rough sketch of their graphs to show what you mean.

a.
$$\begin{cases} 2x - 5y = 7 \\ 6x^2 + y^2 = 3 \end{cases}$$

b.
$$\begin{cases} 3x^2 - 5y^2 = 7 \\ 2x^2 + 5y^2 = 13 \end{cases}$$

5. Use the graphs from part 4b to shade the region that represents the solutions to the system inequalities

$$\begin{cases} 3x^2 - 5y^2 \leq 7 \\ 2x^2 + 5y^2 > 13 \end{cases}$$