

Free Response Practice #31
Calculator Permitted

A colony of ladybugs rapidly multiplies so that the population t days from now is given by the equation

$$A(t) = 3000e^{0.01t}.$$

Similarly, a pesticide is added to another colony of ladybugs so that the population t days from now is given by the equation

$$D(t) = 4500\left(\frac{2}{3}\right)^{0.07t}.$$

a. Find the initial population of each colony of ladybugs. Explain your work.

b. During what day will the growing colony of ladybugs reach a population of 4000 ladybugs?
Show your work.

c. During what day will the pesticide treated colony be halved? Show your work.

d. After how many days will the population of each colony have the same number lady bugs?
Explain how you determined your answer based on the graphs of each function.

Free Response Practice #32
Calculator Permitted

Consider the two logarithm functions below to answer the questions that follow. If ever the value of a logarithm is undefined, explain why it is so.

$$f(x) = \log_3(x - 5) + \log_3 x$$

$$g(x) = \log_3(6 - 4x)$$

- a. Rewrite $f(x)$ as a logarithm function of a single logarithm. Then, find the value of $f(7)$.

- b. If $h(x) = g(x) - f(x)$, find an equation for $h(x)$ that contains a single logarithm and then find the value of $h(1)$.

- c. For what value(s) of x is $f(x) = g(x)$? Show the algebraic analysis that leads to your answer.

Free Response Practice #33
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The relationship between the intensity, I , of light, measured in lumens, at a depth of x feet in Lake Erie is given by the function below.

$$\log\left(\frac{I}{12}\right) = -0.00235x$$

The relationship between the intensity, I , of light, measured in lumens, at a depth of x feet in Lake Superior is given by the function below.

$$\log\left(\frac{I}{12}\right) = -0.0125x$$

- a. What is the intensity of the light in lake Erie at a depth of 70 feet? Show your work and indicate units of measure.

- b. At what depth, to the nearest foot, is the intensity of light in Lake Superior 2.8 lumens? Show your work and indicate correct units of measure.

- c. Solve both intensity equations for I in terms of x . By investigating graphically, at what depth, for $x > 0$, is the intensity in both lakes the same. Show your work and explain your reasoning.