1. [11 points] On April 22, 1994, the museum where Ross worked received a prehistoric cave painting, and a team of scientists tried to determine its age. The painting contains Carbon-14, but only 15% of the original amount of Carbon-14 was left. The team knew that Carbon-14 decays at a *non-continuous* rate of 1.2% each century (100 years). Let $G(c)$ be the amount of Carbon-14, in grams, left in the painting c centuries after April 22, 1994.
(Note that negative values of c correspond to dates prior to April 22, 1994.)

   a. [4 points] If a is the amount of Carbon-14, in grams, the painting contained on April 22, 1994, write a formula for the function $G(c)$. (*Your answer should involve a.*)

Solution: $G(c) = a(0.988)^c$

   b. [3 points] What is the continuous decay rate of the function $G(c)$? Give your answer in **exact** form.

Solution:

$$e^k = 0.988$$
$$\ln(e^k) = \ln(0.988)$$
$$k\ln(e) = \ln(0.988)$$
$$k = \ln(0.988)$$

   c. [4 points] How many centuries before April 22, 1994 was the painting created? Give your answer in **exact** form or estimate it accurately to three decimal places.

Solution: The amount of Carbon-14 when it was first created was $\dfrac{a}{0.15}$ grams.

$$\frac{a}{0.15} = a(0.988)^c$$
$$\ln\left(\frac{1}{0.15}\right) = \ln(0.988^c)$$
$$-\ln(0.15) = c\ln(0.988)$$
$$c = -\frac{\ln(0.15)}{\ln(0.988)} \approx -157.14286$$

The painting was created $\dfrac{\ln(0.15)}{\ln(0.988)}$ *or 157.143 centuries before April 22, 1994.*