1. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

   Uranium is taken out of the reactor with a temperature of 170° *C and is placed into a* 14° *C bath to cool. After 32 minutes, the uranium has cooled to* 126° *C.*

   A. $k = -0.02437$

   B. $k = -0.01035$

   C. $k = -0.01304$

   D. $k = -0.02403$

   E. None of the above

---

2. A town has an initial population of 40000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop.	40000	39965	39945	39930	39919	39910	39902	39896	39890

   A. Logarithmic

   B. Exponential

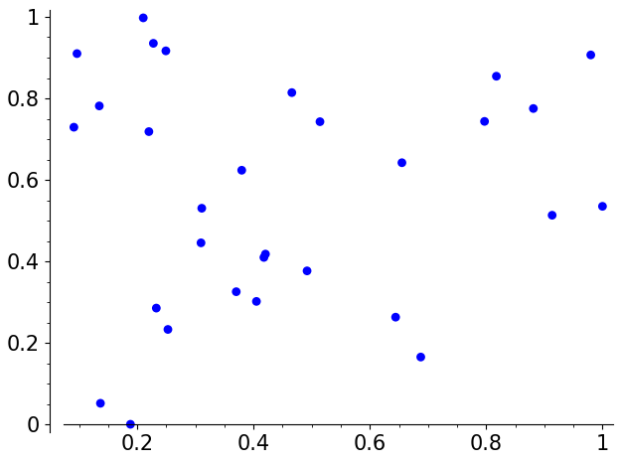
   C. Linear

   D. Non-Linear Power

   E. None of the above

---

3. Determine the appropriate model for the graph of points below.



A. Linear model

B. Logarithmic model

C. Exponential model

D. Non-linear Power model

E. None of the above

---

4. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 973 grams of element X and after 17 years there is 194 grams remaining.

A. About 6935 days

B. About 1095 days

C. About 2555 days

D. About 3650 days

E. None of the above

---

5. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

   A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 1 hours, the petri dish has 25 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 115 minutes

   B. About 19 minutes

   C. About 198 minutes

   D. About 33 minutes

   E. None of the above
