1. 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 4 bacteria-α. After 2 hours, the petri dish has 873 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

   A. About 36 minutes

   B. About 221 minutes

   C. About 92 minutes

   D. About 15 minutes

   E. None of the above

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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	39972	39956	39944	39935	39928	39922	39916	39912

   A. Exponential

   B. Logarithmic

   C. Linear

   D. Non-Linear Power

   E. None of the above

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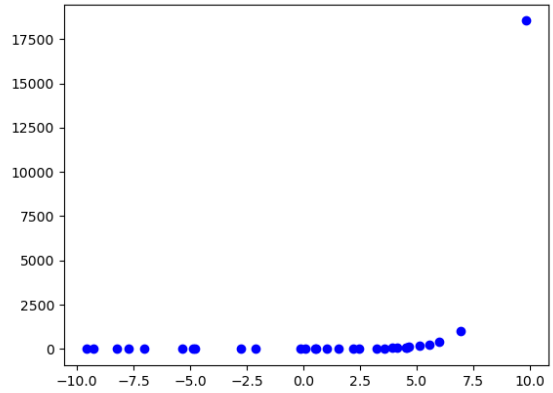
3. Determine the appropriate model for the graph of points below.



A. Linear model

B. Logarithmic model

C. Exponential model

D. Non-linear Power model

E. None of the above

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4. 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 200° *C and is placed into a* 15° *C bath to cool. After 25 minutes, the uranium has cooled to* 137° *C.*

A. $k = -0.01977$

B. $k = -0.03089$

C. $k = -0.01665$

D. $k = -0.03051$

E. None of the above

5. A town has an initial population of 100000. 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.	100046	100086	100126	100166	100206	100246	100286	100326	100

A. Logarithmic

B. Non-Linear Power

C. Linear

D. Exponential

E. None of the above

6. 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 652 grams of element X and after 6 years there is 108 grams remaining.

A. About 730 days

B. About 1095 days

C. About 2555 days

D. About 0 days

E. None of the above

7. 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 543 grams of element X and after 12 years there is 90 grams remaining.

A. About 5110 days

B. About 365 days

C. About 2190 days

D. About 1460 days

E. None of the above

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8. 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 160° *C and is placed into a* 14° *C bath to cool. After 16 minutes, the uranium has cooled to* 115° *C.*

A. $k = -0.02875$

B. $k = -0.02303$

C. $k = -0.04821$

D. $k = -0.04748$

E. None of the above

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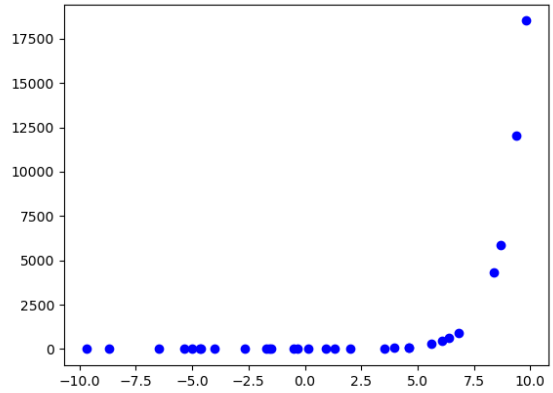
9. Determine the appropriate model for the graph of points below.



A. Linear model

B. Non-linear Power model

C. Exponential model

D. Logarithmic model

E. None of the above

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10. 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 3 hours, the petri dish has 54721 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 120 minutes

B. About 20 minutes

C. About 217 minutes

D. About 36 minutes

E. None of the above
