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 2 bacteria-α. After 1 hours, the petri dish has 10 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

   A. About 215 minutes

   B. About 25 minutes

   C. About 153 minutes

   D. About 35 minutes

   E. None of the above

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2. A town has an initial population of 30000. 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.	29940	29820	29460	28380	25140	15420	0	0	0

   A. Non-Linear Power

   B. Logarithmic

   C. Exponential

   D. Linear

   E. None of the above

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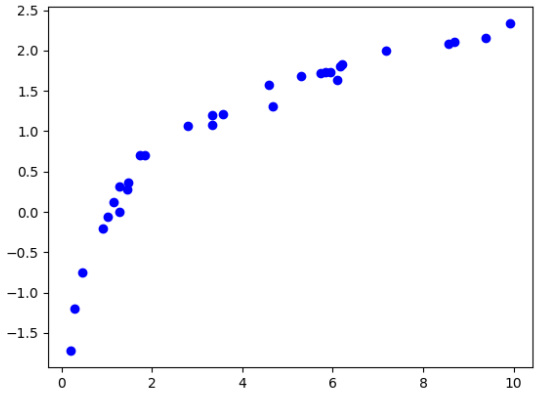
3. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Logarithmic model

C. Exponential model

D. Linear 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 190° *C and is placed into a* 10° *C bath to cool. After 37 minutes, the uranium has cooled to* 132° *C.*

A. $k = -0.01197$

B. $k = -0.01197$

C. $k = -0.02078$

D. $k = -0.02097$

E. None of the above

5. A town has an initial population of 70000. 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.	70000	69986	69978	69972	69967	69964	69961	69958	69956

A. Linear

B. Non-Linear Power

C. Logarithmic

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 700 grams of element X and after 12 years there is 116 grams remaining.

A. About 5110 days

B. About 2190 days

C. About 365 days

D. About 1460 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 569 grams of element X and after 20 years there is 94 grams remaining.

A. About 4015 days

B. About 2555 days

C. About 8760 days

D. About 1095 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 140° *C and is placed into a* 20° *C bath to cool. After 23 minutes, the uranium has cooled to* 74° *C.*

A. $k = -0.02997$

B. $k = -0.02919$

C. $k = -0.03472$

D. $k = -0.04142$

E. None of the above

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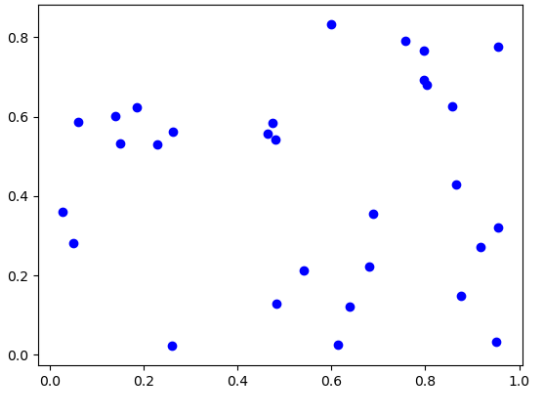
9. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Non-linear Power model

C. Exponential model

D. Linear 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 2 bacteria-α. After 1 hours, the petri dish has 26 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

    A. About 25 minutes

    B. About 152 minutes

    C. About 96 minutes

    D. About 16 minutes

    E. None of the above
