1. 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	100000	100034	100054	100069	100080	100089	100097	100103	100

   A. Logarithmic

   B. Linear

   C. Non-Linear Power

   D. Exponential

   E. None of the above

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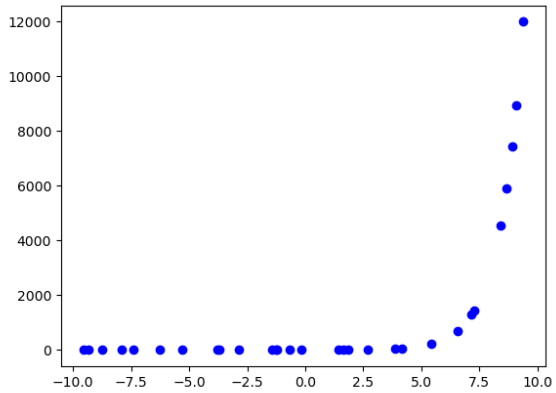
2. Determine the appropriate model for the graph of points below.



   A. Logarithmic model

   B. Linear model

   C. Exponential model

   D. Non-linear Power model

   E. None of the above

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3. 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 554 grams of element X and after 18 years there is 79 grams remaining.

A. About 8395 days

B. About 3285 days

C. About 730 days

D. About 2190 days

E. None of the above

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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 1000 grams of element X and after 5 years there is 111 grams remaining.

A. About 730 days

B. About 2190 days

C. About 365 days

D. About 0 days

E. None of the above

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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 3 hours, the petri dish has 845 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 35 minutes

B. About 352 minutes

C. About 58 minutes

D. About 210 minutes

E. None of the above

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6. A town has an initial population of 50000. 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	49960	49920	49880	49840	49800	49760	49720	49680	49640

A. Linear

B. Logarithmic

C. Non-Linear Power

D. Exponential

E. None of the above

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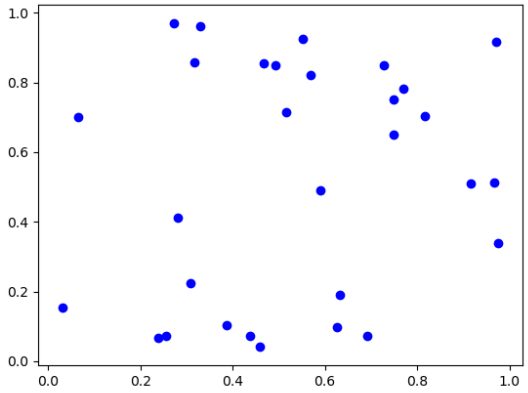
7. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Non-linear Power model

C. Exponential model

D. Linear model

E. None of the above

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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* 18° *C bath to cool. After 23 minutes, the uranium has cooled to* 90° *C.*

A. $k = -0.02891$

B. $k = -0.03129$

C. $k = -0.03204$

D. $k = -0.02891$

E. None of the above

9. 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 69 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 31 minutes

   B. About 186 minutes

   C. About 20 minutes

   D. About 125 minutes

   E. None of the above

10. 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 150° C and is placed into a 13° C bath to cool. After 19 minutes, the uranium has cooled to 89° C.

    A. $k = -0.03792$

    B. $k = -0.03578$

    C. $k = -0.03850$

    D. $k = -0.03578$

    E. None of the above