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

   A. About 291 minutes

   B. About 260 minutes

   C. About 43 minutes

   D. About 48 minutes

   E. None of the above

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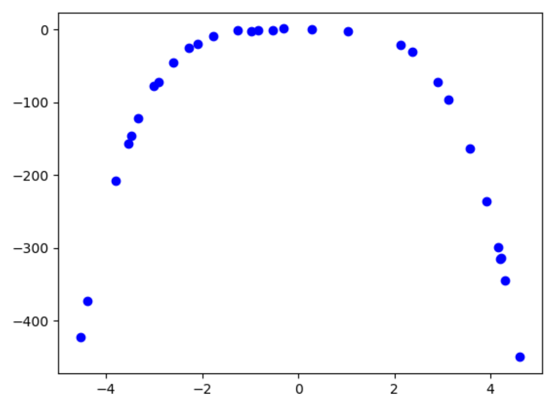
2. Determine the appropriate model for the graph of points below.



   A. Linear model

   B. Exponential model

   C. Logarithmic model

   D. Non-linear Power model

   E. None of the above

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3. 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 3 hours, the petri dish has 101 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 323 minutes

B. About 53 minutes

C. About 190 minutes

D. About 31 minutes

E. None of the above

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4. A town has an initial population of 20000. 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	20024	20058	20092	20126	20144	20178	20212	20246	20264

A. Exponential

B. Linear

C. Non-Linear Power

D. Logarithmic

E. None of the above

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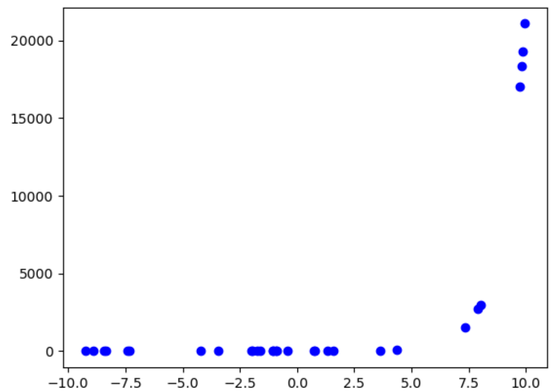
5. Determine the appropriate model for the graph of points below.



A. Exponential model

B. Logarithmic model

C. Linear model

D. Non-linear Power model

E. None of the above

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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 962 grams of element X and after 19 years there is 137 grams remaining.

A. About 3285 days

B. About 8395 days

C. About 730 days

D. About 2190 days

E. None of the above

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7. A town has an initial population of 80000. 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	80046	80086	80126	80166	80206	80246	80286	80326	80366

A. Linear

B. Exponential

C. Logarithmic

D. Non-Linear Power

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 130° *C and is placed into a* 15° *C bath to cool. After 25 minutes, the uranium has cooled to* 64° *C.*

A. $k = -0.03903$

B. $k = -0.02710$

C. $k = -0.03903$

D. $k = -0.02653$

E. None of the above

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9. 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 602 grams of element X and after 18 years there is 66 grams remaining.

A. About 1825 days

B. About 365 days

C. About 8760 days

D. About 2920 days

E. None of the above

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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 130° *C and is placed into a* 15° *C bath to cool. After 20 minutes, the uranium has cooled to* 87° *C.*

A. $k = -0.03644$

B. $k = -0.02341$

C. $k = -0.03722$

D. $k = -0.02954$

E. None of the above
