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 $130°$ *C and is placed into a* $15°$ *C bath to cool. After 24 minutes, the uranium has cooled to* $67°$ *C.*

   A. $k = -0.02806$

   B. $k = -0.04440$

   C. $k = -0.03818$

   D. $k = -0.02866$

   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	40024	40058	40092	40126	40144	40178	40212	40246	40264

   A. Linear

   B. Exponential

   C. Logarithmic

   D. Non-Linear Power

   E. None of the above

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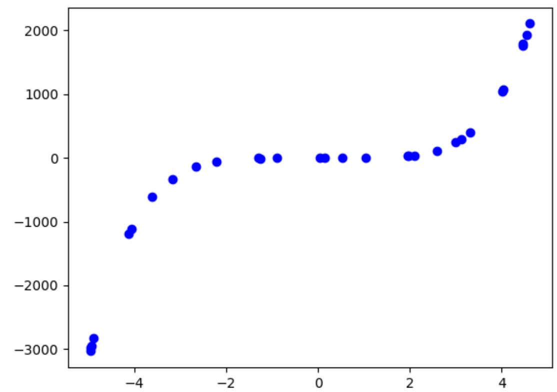
3. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Linear model

C. Non-linear Power model

D. Exponential model

E. None of the above

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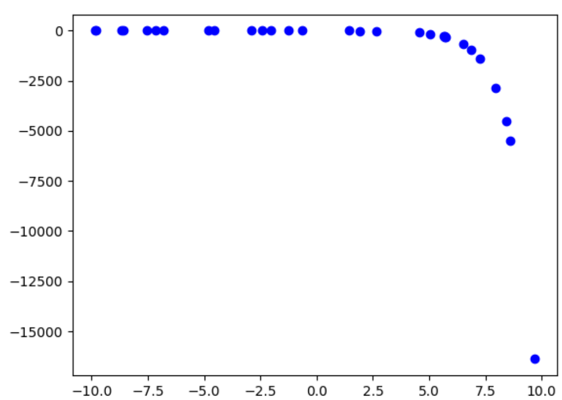
4. Determine the appropriate model for the graph of points below.



A. Exponential model

B. Non-linear Power model

C. Linear model

D. Logarithmic model

E. None of the above

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5. 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 607 grams of element X and after 4 years there is 86 grams remaining.

   A. About 730 days

   B. About 0 days

   C. About 1825 days

   D. About 365 days

   E. None of the above

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6. 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 180° *C and is placed into a* 14° *C bath to cool. After 31 minutes, the uranium has cooled to* 140° *C.*

   A. $k = -0.01151$

   B. $k = -0.00889$

   C. $k = -0.02553$

   D. $k = -0.02519$

   E. None of the above

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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 932 grams of element X and after 3 years there is 93 grams remaining.

   A. About 0 days

   B. About 365 days

   C. About 1460 days

   D. About 0 days

   E. None of the above

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8. A town has an initial population of 60000. 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	60000	59965	59945	59930	59919	59910	59902	59896	59890

   A. Exponential

   B. Non-Linear Power

   C. Logarithmic

   D. Linear

   E. None of the above

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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 2 bacteria-α. After 1 hours, the petri dish has 7 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 53 minutes

B. About 319 minutes

C. About 49 minutes

D. About 298 minutes

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 2 hours, the petri dish has 5176 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 116 minutes

B. About 63 minutes

C. About 10 minutes

D. About 19 minutes

E. None of the above
