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 110° *C and is placed into a* 17° *C bath to cool. After 10 minutes, the uranium has cooled to* 54° *C.*

   A. $k = -0.06527$

   B. $k = -0.06334$

   C. $k = -0.10896$

   D. $k = -0.10896$

   E. None of the above

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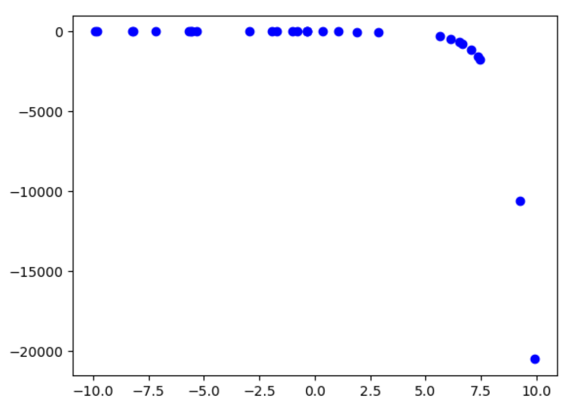
2. Determine the appropriate model for the graph of points below.



   A. Exponential model

   B. Logarithmic model

   C. Non-linear Power model

   D. Linear model

E. None of the above

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3. 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* 11° *C bath to cool. After 22 minutes, the uranium has cooled to* 146° *C.*

   A. $k = -0.03540$

   B. $k = -0.01529$

   C. $k = -0.03572$

   D. $k = -0.01787$

   E. None of the above

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4. 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 8 bacteria-*α*. Based on similar bacteria, the lab believes bacteria-*α *doubles after some undetermined number of minutes.*

   A. About 362 minutes

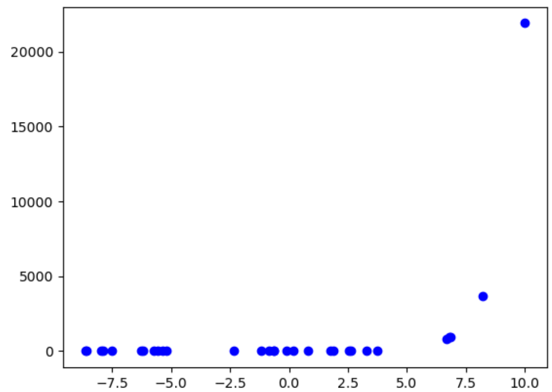
   B. About 60 minutes

   C. About 365 minutes

   D. About 60 minutes

   E. None of the above

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



A. Exponential model

B. Non-linear Power model

C. Logarithmic model

D. Linear model

E. None of the above

6. 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	99970	99940	99910	99880	99850	99820	99790	99760	99730

A. Non-Linear Power

B. Logarithmic

C. Linear

D. Exponential

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 511 grams of element X and after 20 years there is 56 grams remaining.

A. About 730 days

B. About 2190 days

C. About 9855 days

D. About 3285 days

E. None of the above

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8. A town has an initial population of 90000. 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	90000	89972	89956	89944	89935	89928	89922	89916	89912

A. Linear

B. Non-Linear Power

C. Exponential

D. Logarithmic

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 558 grams of element X and after 14 years there is 93 grams remaining.*

A. About 2555 days

B. About 1825 days

C. About 730 days

D. About 6205 days

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 3 hours, the petri dish has 1261 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.*

A. About 209 minutes

B. About 19 minutes

C. About 116 minutes

D. About 34 minutes

E. None of the above
