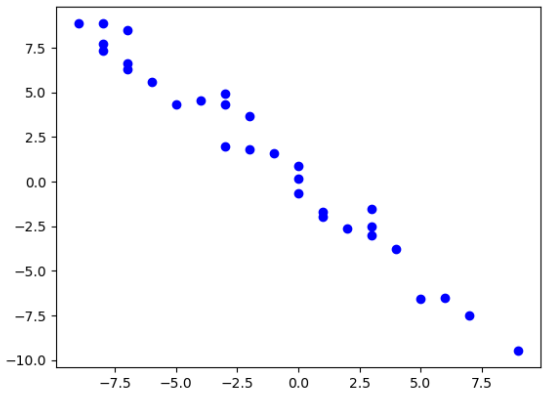
1. Determine the appropriate model for the graph of points below.



A. Linear model

B. Logarithmic model

C. Non-linear Power model

D. Exponential model

E. None of the above

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2. 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 653 grams of element X and after 12 years there is 81 grams remaining.

A. About 1825 days

B. About 1095 days

C. About 5475 days

D. About 365 days

E. None of the above

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 633 grams of element X and after 16 years there is 63 grams remaining.

A. About 365 days

B. About 8030 days

C. About 2190 days

D. About 1460 days

E. None of the above

4. 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	90090	90270	90810	92430	97290	111870	155610	286830	680490

A. Exponential

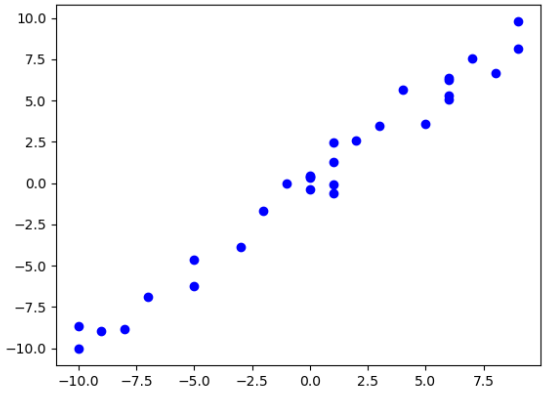
B. Non-Linear Power

C. Linear

D. Logarithmic

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

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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 150° *C and is placed into a* 12° *C bath to cool. After 36 minutes, the uranium has cooled to* 97° *C.*

   A. $k = -0.01578$

   B. $k = -0.01346$

   C. $k = -0.02053$

   D. $k = -0.02082$

   E. None of the above

7. 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 382441 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

   A. About 21 minutes

   B. About 127 minutes

   C. About 208 minutes

   D. About 34 minutes

   E. None of the above

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 10° C bath to cool. After 28 minutes, the uranium has cooled to 87° C.

   A. $k = -0.02135$

   B. $k = -0.02644$

   C. $k = -0.02611$

   D. $k = -0.02135$

   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 4 bacteria-α. After 3 hours, the petri dish has 274 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

   A. About 280 minutes

   B. About 46 minutes

   C. About 477 minutes

   D. About 79 minutes

   E. None of the above

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10. 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	79972	79938	79904	79886	79852	79818	79784	79766	79732

   A. Logarithmic

   B. Exponential

   C. Non-Linear Power

   D. Linear

   E. None of the above
