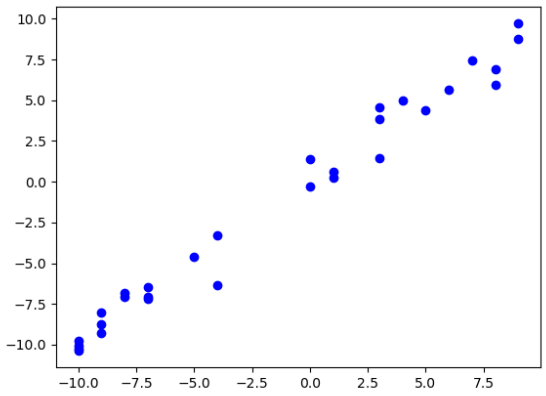
1. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Exponential model

C. Logarithmic model

D. Linear 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 893 grams of element X and after 13 years there is 89 grams remaining.

A. About 1825 days

B. About 6205 days

C. About 365 days

D. About 1095 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 821 grams of element X and after 17 years there is 164 grams remaining.

A. About 7300 days

B. About 3650 days

C. About 2555 days

D. About 1095 days

E. None of the above

4. 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	79920	79680	78720	74880	59520	0	0	0	0

A. Linear

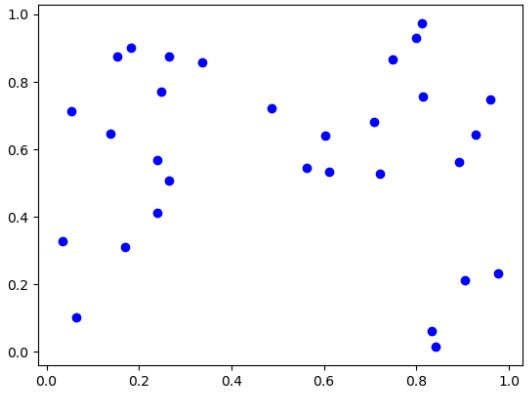
B. Logarithmic

C. Non-Linear Power

D. Exponential

E. None of the above

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



A. Linear model

B. Logarithmic model

C. Exponential model

D. Non-linear Power 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 170° *C and is placed into a* 11° *C bath to cool. After 25 minutes, the uranium has cooled to* 111° *C.*

A. $k = -0.03002$

B. $k = -0.03035$

C. $k = -0.02123$

D. $k = -0.01855$

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 2 bacteria-α. After 3 hours, the petri dish has 5807 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 172 minutes

   B. About 15 minutes

   C. About 93 minutes

   D. About 28 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 200° *C and is placed into a* 14° *C bath to cool. After 13 minutes, the uranium has cooled to* 155° *C.*

   A. $k = -0.02131$

   B. $k = -0.06115$

   C. $k = -0.02689$

   D. $k = -0.06044$

   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 2 bacteria-α. After 1 hours, the petri dish has 11 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

   A. About 261 minutes

   B. About 43 minutes

   C. About 222 minutes

   D. About 37 minutes

   E. None of the above

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10. 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	59975	59937	59907	59885	59855	59817	59787	59765	59735

   A. Exponential

   B. Non-Linear Power

   C. Linear

   D. Logarithmic

   E. None of the above
