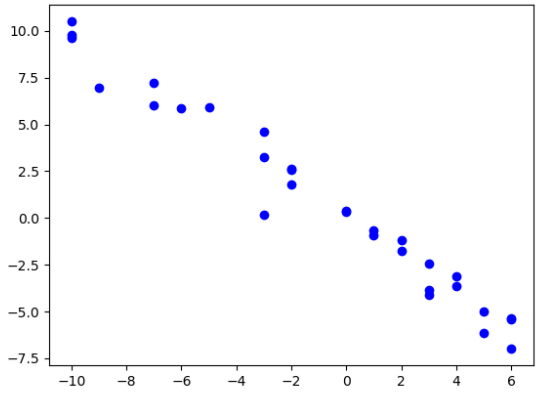
1. Determine the appropriate model for the graph of points below.



   A. Linear model
   B. Non-linear Power model
   C. Logarithmic model
   D. Exponential model
   E. None of the above

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2. 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 76 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

   A. About 38 minutes
   B. About 230 minutes
   C. About 445 minutes
   D. About 74 minutes
   E. None of the above

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3. A town has an initial population of 30000. 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.	30000	29979	29967	29958	29951	29946	29941	29937	29934

A. Logarithmic

B. Linear

C. Exponential

D. Non-Linear Power

E. None of the above

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4. 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 920 grams of element X and after 20 years there is 92 grams remaining.

A. About 730 days

B. About 9855 days

C. About 2190 days

D. About 2920 days

E. None of the above

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5. 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 1 hours, the petri dish

has 64 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 214 minutes

B. About 23 minutes

C. About 35 minutes

D. About 142 minutes

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 110° *C and is placed into a* 14° *C bath to cool. After 13 minutes, the uranium has cooled to* 70° *C.*

A. $k = -0.05193$

B. $k = -0.05432$

C. $k = -0.05193$

D. $k = -0.05565$

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 680 grams of element X and after 7 years there is 75 grams remaining.

A. About 3285 days

B. About 730 days

C. About 0 days

D. About 1095 days

E. None of the above

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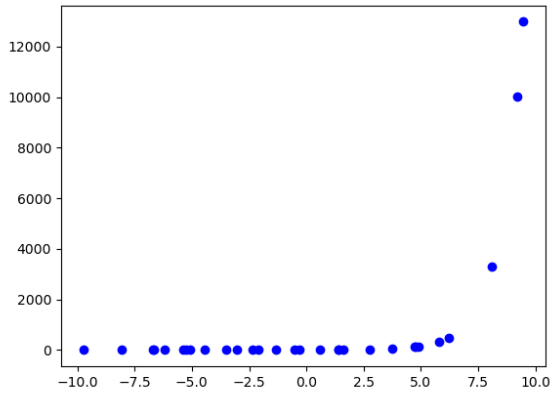
8. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Linear model

C. Exponential model

D. Non-linear Power model

E. None of the above

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9. 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 28 minutes, the uranium has cooled to* 108° *C.*

A. $k = -0.02663$

B. $k = -0.02692$

C. $k = -0.02004$

D. $k = -0.01765$

E. None of the above

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10. 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.	90020	90040	90060	90080	90100	90120	90140	90160	90180

A. Logarithmic

B. Exponential

C. Linear

D. Non-Linear Power

E. None of the above
