1. A town has an initial population of 20000. 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.	20000	19965	19945	19930	19919	19910	19902	19896	19890

   A. Exponential

   B. Non-Linear Power

   C. Linear

   D. Logarithmic

   E. None of the above

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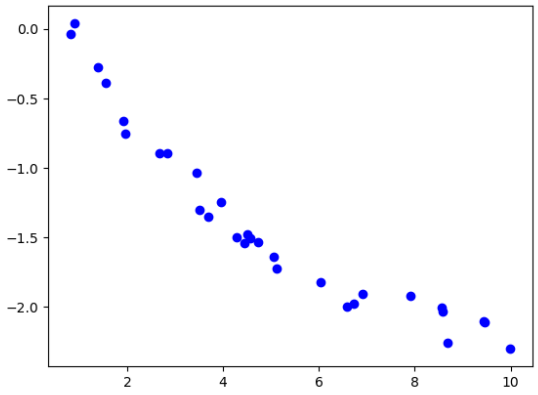
2. Determine the appropriate model for the graph of points below.



   A. Exponential model

   B. Non-linear Power model

   C. Linear model

   D. Logarithmic model

   E. None of the above

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3. 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 8093 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 16 minutes

B. About 98 minutes

C. About 41 minutes

D. About 249 minutes

E. None of the above

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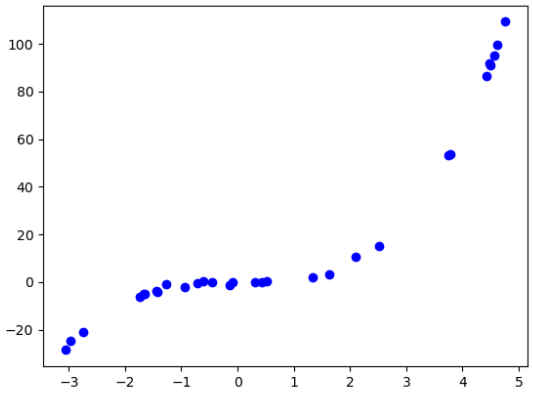
4. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Non-linear Power model

C. Exponential model

D. Linear model

E. None of the above

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5. 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 120° *C and is placed into a* 12° *C bath to cool. After 19 minutes, the uranium has cooled to* 66° *C.*

   A. $k = -0.03695$

   B. $k = -0.03648$

   C. $k = -0.03628$

   D. $k = -0.04203$

   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 190° *C and is placed into a* 10° *C bath to cool. After 12 minutes, the uranium has cooled to* 139° *C.*

   A. $k = -0.03227$

   B. $k = -0.06483$

   C. $k = -0.06539$

   D. $k = -0.03227$

   E. None of the above

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7. 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.	100027	100057	100095	100125	100147	100177	100215	100245	100

A. Non-Linear Power

B. Exponential

C. Logarithmic

D. Linear

E. None of the above

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8. 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 967 grams of element X and after 20 years there is 161 grams remaining.

A. About 2555 days

B. About 8760 days

C. About 1095 days

D. About 4015 days

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 925 grams of element X and after 13 years there is 185 grams remaining.

A. About 730 days

B. About 1825 days

C. About 5475 days

D. About 2920 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 11718 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 28 minutes

B. About 39 minutes

C. About 172 minutes

D. About 239 minutes

E. None of the above
