1. 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 6084 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 222 minutes

D. About 37 minutes

E. None of the above

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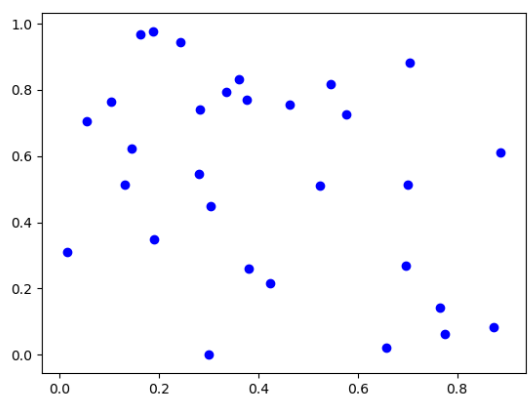
2. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Linear model

C. Non-linear Power model

D. Exponential model

E. None of the above

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3. A town has an initial population of 50000. 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.	50000	50020	50032	50041	50048	50053	50058	50062	50065

A. Linear

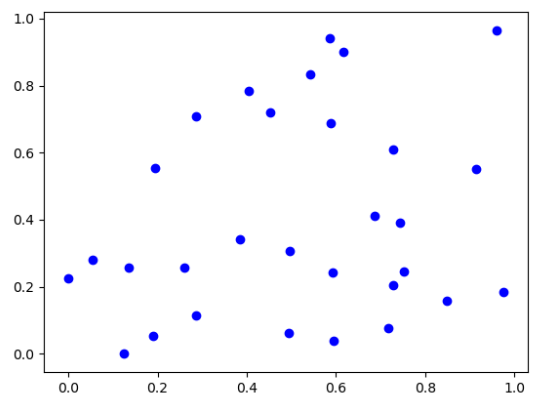
B. Exponential

C. Non-Linear Power

D. Logarithmic

E. None of the above

4. 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

5. A town has an initial population of 50000. 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.	50000	50013	50021	50027	50032	50035	50038	50041	50043

A. Linear

B. Exponential

C. Logarithmic

D. Non-Linear Power

E. None of the above

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6. 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 654 grams of element X and after 13 years there is 72 grams remaining.

A. About 365 days

B. About 6205 days

C. About 1460 days

D. About 1825 days

E. None of the above

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7. 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 $180°$ *C and is placed into a* $15°$ *C bath to cool. After 29 minutes, the uranium has cooled to* $124°$ *C.*

A. $k = -0.01730$

B. $k = -0.01730$

C. $k = -0.02612$

D. $k = -0.02649$

E. None of the above

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8. 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 239 bacteria-*α*. Based on similar bacteria, the lab believes bacteria-*α *doubles after some undetermined number of minutes.*

A. About 30 minutes

B. About 409 minutes

C. About 68 minutes

D. About 182 minutes

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 $190°$ *C and is placed into a* $10°$ *C bath to cool. After 35 minutes, the uranium has* *cooled to* 138° *C.*

A. $k = -0.01129$

B. $k = -0.02219$

C. $k = -0.02239$

D. $k = -0.01129$

E. None of the above

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10. 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 690 grams of element X and after 15 years there is 86 grams remaining.

A. About 6935 days

B. About 1460 days

C. About 365 days

D. About 2555 days

E. None of the above
