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 4 bacteria-α. After 3 hours, the petri dish has 2756 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

A. About 19 minutes

B. About 47 minutes

C. About 283 minutes

D. About 114 minutes

E. None of the above

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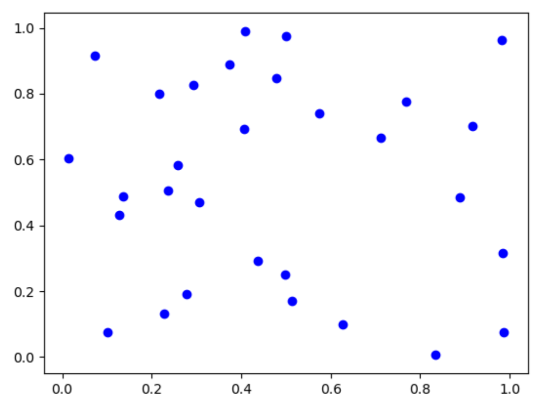
2. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Linear model

C. Exponential model

D. Logarithmic model

E. None of the above

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3. 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.	90000	90013	90021	90027	90032	90035	90038	90041	90043

A. Linear

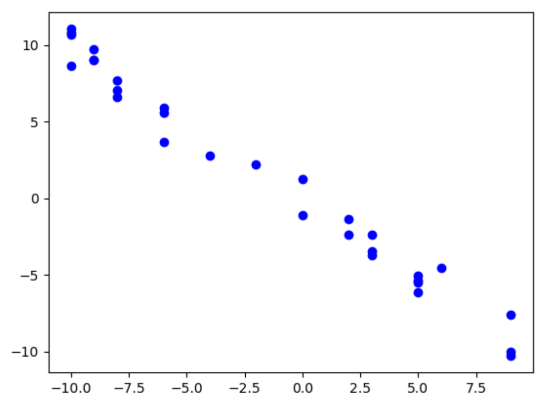
B. Logarithmic

C. Exponential

D. Non-Linear Power

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.	49840	49360	47440	39760	9040	0	0	0	0

A. Linear

B. Logarithmic

C. Exponential

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 515 grams of element X and after 16 years there is 57 grams remaining.

A. About 365 days

B. About 7665 days

C. About 1825 days

D. About 2555 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 130° *C and is placed into a* 20° *C bath to cool. After 23 minutes, the uranium has cooled to* 65° *C.*

A. $k = -0.04612$

B. $k = -0.02903$

C. $k = -0.02821$

D. $k = -0.04612$

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 2 bacteria-*α*. After 1 hours, the petri dish has 12 bacteria-*α*. Based on similar bacteria, the lab believes bacteria-*α *triples after some undetermined number of minutes.*

A. About 32 minutes

B. About 195 minutes

C. About 22 minutes

D. About 133 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 180° *C and is placed into a* 12° *C bath to cool. After 18 minutes, the uranium has* *cooled to* $124°$ *C.*

A. $k = -0.02636$

B. $k = -0.04281$

C. $k = -0.04233$

D. $k = -0.02636$

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 533 grams of element X and after 9 years there is 76 grams remaining.

A. About 1460 days

B. About 4015 days

C. About 365 days

D. About 1095 days

E. None of the above
