1. 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* 16° *C bath to cool. After 10 minutes, the uranium has cooled to* 75° *C.*

   A. $k = -0.05669$

   B. $k = -0.07100$

   C. $k = -0.07045$

   D. $k = -0.07224$

   E. None of the above

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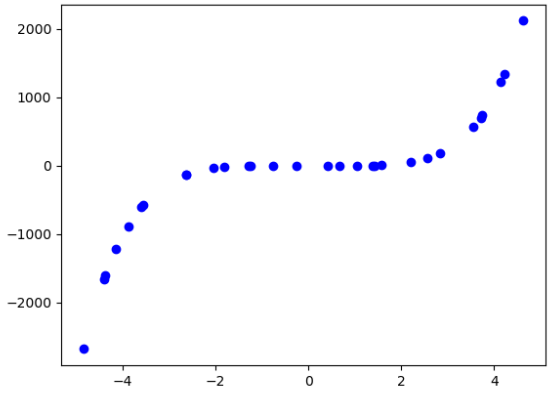
2. Determine the appropriate model for the graph of points below.



   A. Linear model

   B. Logarithmic model

   C. Exponential model

   D. Non-linear Power model

E. None of the above

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3. 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* 20° *C bath to cool. After 37 minutes, the uranium has cooled to* 156° *C.*

A. $k = -0.00758$

B. $k = -0.02108$

C. $k = -0.02144$

D. $k = -0.01042$

E. None of the above

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4. 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 2 hours, the petri dish has 61 bacteria-*α*. Based on similar bacteria, the lab believes bacteria-*α *doubles after some undetermined number of minutes.*

A. About 52 minutes

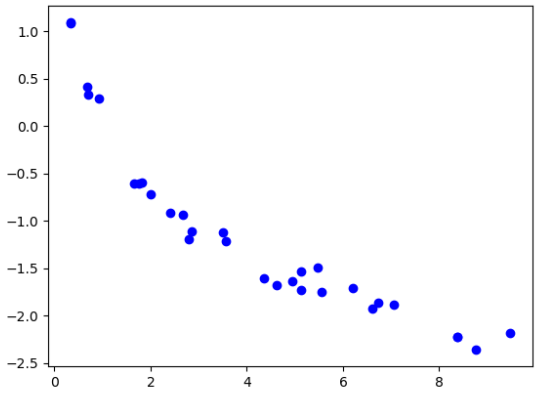
B. About 38 minutes

C. About 313 minutes

D. About 230 minutes

E. None of the above

5. 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

6. A town has an initial population of 70000. 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	70040	70080	70120	70160	70200	70240	70280	70320	70360

A. Logarithmic

B. Non-Linear Power

C. Exponential

D. Linear

E. None of the above

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 607 grams of element X and after 5 years there is 121 grams remaining.

A. About 730 days

B. About 1825 days

C. About 1095 days

D. About 0 days

E. None of the above

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8. 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	59978	59966	59938	59926	59898	59886	59858	59846	59818

A. Exponential

B. Logarithmic

C. Linear

D. Non-Linear Power

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 876 grams of element X and after 15 years there is 146 grams remaining.

A. About 2920 days

B. About 730 days

C. About 6570 days

D. About 1825 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 3 bacteria-α. After 3 hours, the petri dish has 50499 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 12 minutes

B. About 76 minutes

C. About 29 minutes

D. About 178 minutes

E. None of the above
