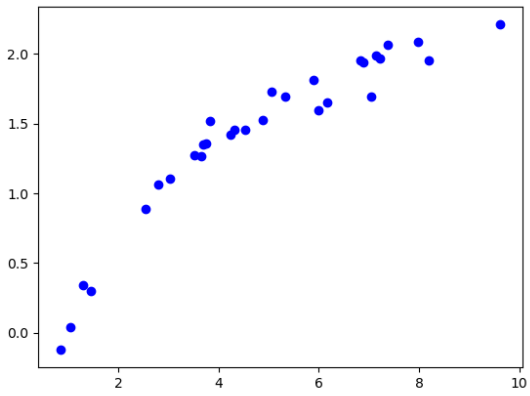
1. Determine the appropriate model for the graph of points below.



   A. Non-linear Power model

   B. Exponential model

   C. Linear model

   D. Logarithmic model

   E. None of the above

---

2. 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 8 years there is 60 grams remaining.

   A. About 0 days

   B. About 4015 days

   C. About 1095 days

   D. About 730 days

   E. None of the above

3. 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 612 grams of element X and after 5 years there is 87 grams remaining.

A. About 0 days

B. About 730 days

C. About 365 days

D. About 2190 days

E. None of the above

4. 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	90030	90060	90090	90120	90150	90180	90210	90240	90270

A. Linear

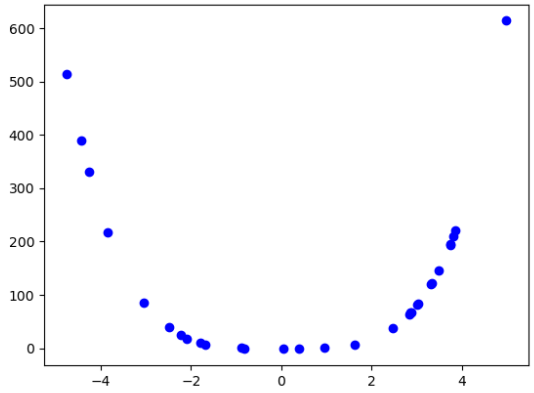
B. Non-Linear Power

C. Logarithmic

D. Exponential

E. None of the above

5. 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

---

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 170° *C and is placed into a* 10° *C bath to cool. After 16 minutes, the uranium has cooled to* 119° *C.*

A. $k = -0.02778$

B. $k = -0.02778$

C. $k = -0.04779$

D. $k = -0.04826$

E. None of the above

7. 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 2 hours, the petri dish has 30 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

   A. About 77 minutes

   B. About 341 minutes

   C. About 56 minutes

   D. About 463 minutes

   E. None of the above

8. 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 13° C bath to cool. After 10 minutes, the uranium has cooled to 60° C.

   A. $k = -0.06653$

   B. $k = -0.06787$

   C. $k = -0.09373$

   D. $k = -0.08227$

   E. None of the above

9. 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 2 hours, the petri dish has 907 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

   A. About 43 minutes

   B. About 174 minutes

   C. About 29 minutes

   D. About 262 minutes

   E. None of the above

---

10. 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	19986	19978	19972	19967	19964	19961	19958	19956

   A. Linear

   B. Non-Linear Power

   C. Exponential

   D. Logarithmic

   E. None of the above
