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 2 bacteria-α. After 3 hours, the petri dish has 358 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

A. About 42 minutes

B. About 254 minutes

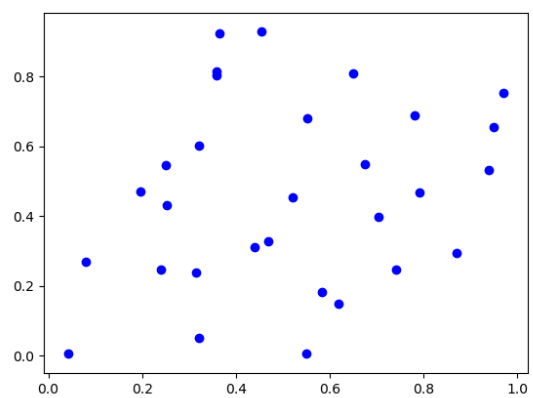
C. About 144 minutes

D. About 24 minutes

E. None of the above

---

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



A. Logarithmic model

B. Exponential model

C. Linear model

D. Non-linear Power model

E. None of the above

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 3 bacteria-α. After 3 hours, the petri dish has 2064 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 351 minutes

B. About 38 minutes

C. About 229 minutes

D. About 58 minutes

E. None of the above

---

4. 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	100000	100020	100032	100041	100048	100053	100058	100062	100

A. Logarithmic

B. Linear

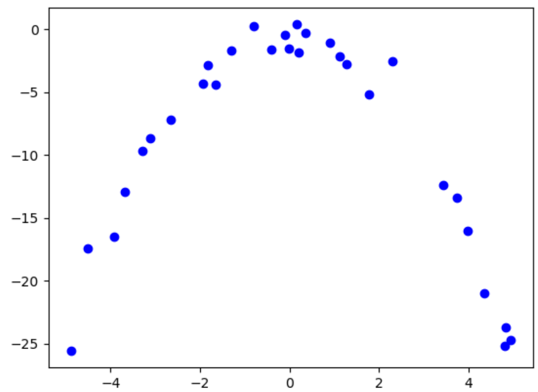
C. Exponential

D. Non-Linear Power

E. None of the above

---

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



A. Logarithmic model

B. Non-linear Power model

C. Linear model

D. Exponential model

E. None of the above

---

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 727 grams of element X and after 10 years there is 103 grams remaining.

A. About 365 days

B. About 1095 days

C. About 1825 days

D. About 4380 days

E. None of the above

7. 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	60120	60360	61080	63240	69720	89160	147480	322440	847320

A. Non-Linear Power

B. Logarithmic

C. Linear

D. Exponential

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 $150°$ *C and is placed into a* $19°$ *C bath to cool. After 10 minutes, the uranium has cooled to* $93°$ *C.*

A. $k = -0.07066$

B. $k = -0.07326$

C. $k = -0.07066$

D. $k = -0.07161$

E. None of the above

---

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 664 grams of element X and after 7 years there is 94 grams remaining.

A. About 0 days

B. About 730 days

C. About 1095 days

D. About 2920 days

E. None of the above

---

10. 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 140° *C and is placed into a* 17° *C bath to cool. After 22 minutes, the uranium has cooled to* 84° *C.*

A. $k = -0.03217$

B. $k = -0.03350$

C. $k = -0.03288$

D. $k = -0.03350$

E. None of the above
