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

   A. About 46 minutes

   B. About 280 minutes

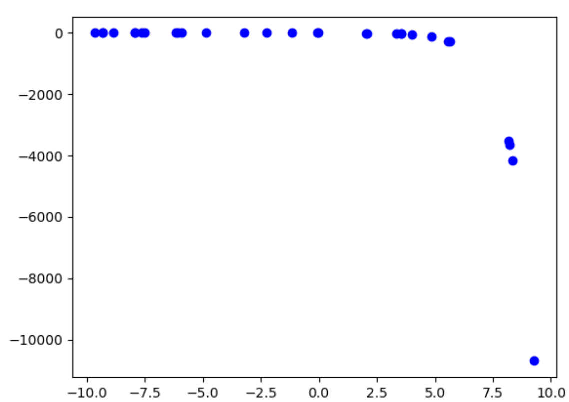
   C. About 207 minutes

   D. About 34 minutes

   E. None of the above

---

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



   A. Non-linear Power model

   B. Logarithmic model

   C. Exponential model

   D. Linear model

   E. None of the above

3. 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.	60000	60013	60021	60027	60032	60035	60038	60041	60043

A. Exponential

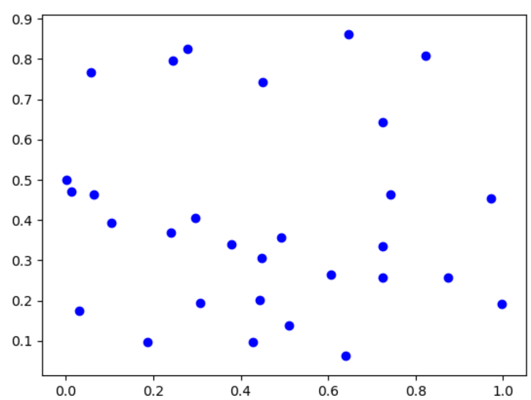
B. Non-Linear Power

C. Logarithmic

D. Linear

E. None of the above

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



A. Exponential model

B. Linear model

C. Logarithmic model

D. Non-linear Power model

E. None of the above

5. 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. Exponential

B. Logarithmic

C. Non-Linear Power

D. Linear

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 935 grams of element X and after 20 years there is 116 grams remaining.

A. About 9125 days

B. About 3285 days

C. About 730 days

D. About 2190 days

E. None of the above

---

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 140° *C and is placed into a* 10° *C bath to cool. After 31 minutes, the uranium has cooled to* 71° *C.*

A. $k = -0.02680$

B. $k = -0.02232$

C. $k = -0.02260$

D. $k = -0.02441$

E. None of the above

---

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 3 bacteria-*α*. After 3 hours, the petri dish has 75 bacteria-*α*. Based on similar bacteria, the lab believes bacteria-*α *doubles after some undetermined number of minutes.*

A. About 61 minutes

B. About 368 minutes

C. About 91 minutes

D. About 549 minutes

E. None of the above

---

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 160° *C and is placed into a* 18° *C bath to cool. After 18 minutes, the uranium has* *cooled to* 113° *C.*

A. $k = -0.02896$

B. $k = -0.02233$

C. $k = -0.04248$

D. $k = -0.04164$

E. None of the above

---

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 864 grams of element X and after 16 years there is 123 grams remaining.

A. About 730 days

B. About 1825 days

C. About 2920 days

D. About 7300 days

E. None of the above
