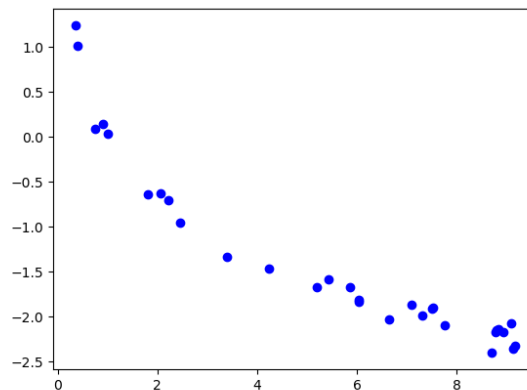


1. A town has an initial population of 40000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	39947	39897	39855	39805	39747	39697	39655	39605	39547

- A. Linear
- B. Logarithmic
- C. Exponential
- D. Non-Linear Power
- E. None of the above

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

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 689 grams of element X and after 12 years there is 114 grams remaining.*

- A. About 5110 days
- B. About 1460 days
- C. About 2190 days
- D. About 365 days
- E. None of the above

4. 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 616 grams of element X and after 14 years there is 68 grams remaining.*

- A. About 6935 days
- B. About 2190 days
- C. About 365 days
- D. About 1460 days
- E. None of the above

5. Using the scenario below, model the population of bacteria  $\alpha$  in terms of the number of minutes,  $t$  that pass. Then, choose the correct approximate (*rounded to the nearest minute*) replication rate of bacteria- $\alpha$ .

*A newly discovered bacteria,  $\alpha$ , is being examined in a lab. The lab started with a petri dish of 3 bacteria- $\alpha$ . After 3 hours, the petri dish has 91 bacteria- $\alpha$ . Based on similar bacteria, the lab believes bacteria- $\alpha$  doubles after some undetermined number of minutes.*

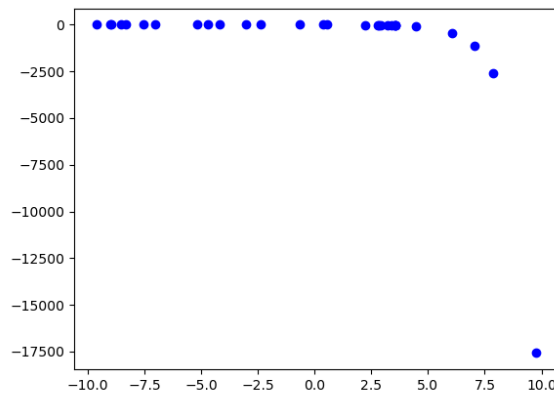
- A. About 87 minutes
- B. About 525 minutes
- C. About 347 minutes
- D. About 57 minutes
- E. None of the above

6. 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	60040	60080	60120	60160	60200	60240	60280	60320	60360

- A. Logarithmic
- B. Linear
- C. Non-Linear Power
- D. Exponential
- E. None of the above

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



- A. Exponential model
- B. Logarithmic model
- C. Non-linear Power model
- D. Linear model
- 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  $110^\circ\text{C}$  and is placed into a  $18^\circ\text{C}$  bath to cool. After 13 minutes, the uranium has cooled to  $57^\circ\text{C}$ .*

- A.  $k = -0.06602$
- B.  $k = -0.04944$
- C.  $k = -0.05104$
- D.  $k = -0.07976$
- E. None of the above

- 
9. Using the scenario below, model the population of bacteria  $\alpha$  in terms of the number of minutes,  $t$  that pass. Then, choose the correct approximate (rounded to the nearest minute) replication rate of bacteria- $\alpha$ .

*A newly discovered bacteria,  $\alpha$ , is being examined in a lab. The lab started with a petri dish of 2 bacteria- $\alpha$ . After 3 hours, the petri dish has 307 bacteria- $\alpha$ . Based on similar bacteria, the lab believes bacteria- $\alpha$  triples after some undetermined number of minutes.*

- A. About 56 minutes
- B. About 337 minutes
- C. About 39 minutes
- D. About 235 minutes
- 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  $180^\circ\text{C}$  and is placed into a  $16^\circ\text{C}$  bath to cool. After 25 minutes, the uranium has cooled to  $116^\circ\text{C}$ .*

- A.  $k = -0.03020$
  - B.  $k = -0.02351$
  - C.  $k = -0.02974$
  - D.  $k = -0.02351$
  - E. None of the above
-