1. For the scenario below, model the rate of vibration (cm/s) of the string in terms of the length of the string. Then determine the variation constant k of the model (if possible). The constant should be in terms of cm and s.

   The rate of vibration of a string under constant tension varies based on the type of string and the length of the string. The rate of vibration of string ω increases as the square length of the string decreases. For example, when string ω is 2 mm long, the rate of vibration is 22 cm/s.

   A. $k = 550.00$

   B. $k = 5.50$

   C. $k = 88.00$

   D. $k = 0.88$

   E. None of the above.

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2. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$ to find the coefficient for the model of the new volume $V_{extnew} = kr^2 h$.

   Pepsi wants to increase the volume of soda in their cans. They've decided to increase the radius by 18 percent and decrease the height by 12 percent. They want to model the new volume based on the radius and height of the original cans.

   A. $k = 0.01221$

   B. $k = 1.22531$

   C. $k = 3.84943$

   D. $k = 0.00389$

   E. None of the above.

---

3. Choose the model type that would best describe the scenario below.

   Big O notation is common in computer science to describe how fast a

program can solve a particular problem. Big O notation categorizes functions according to their growth rates, the same way we have categorized modeling real-world problems by certain types of functions. When analyzing a particular program, a student found the computer to need x^x time to complete, where x was the number of inputs into the program.

A. Direct variation

B. Joint variation

C. Indirect variation

D. None of the above

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4. A town has an initial population of 100000. The town's population for the next 9 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	100120	100360	101080	103240	109720	129160	187480	362440	887

A. Logarithmic

B. Non-Linear Power

C. Linear

D. Exponential

E. None of the above

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5. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$ to find the coefficient for the model of the new volume $V_{extnew} = kr^2 h$.

Pepsi wants to increase the volume of soda in their cans. They've decided to increase the radius by 12 percent and increase the height by 11 percent. They want to model the new volume based on the radius and height of the original cans.

A. $k = 0.00498$

B. $k = 4.37430$

C. $k = 0.00158$

D. $k = 1.39238$

E. None of the above.

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6. For the scenario below, model the rate of vibration (cm/s) of the string in terms of the length of the string. Then determine the variation constant k of the model (if possible). The constant should be in terms of cm and s.

   The rate of vibration of a string under constant tension varies based on the type of string and the length of the string. The rate of vibration of string ω decreases as the square length of the string increases. For example, when string ω is 3 mm long, the rate of vibration is 26 cm/s.

   A. $k = 234.00$

   B. $k = 2.34$

   C. $k = 2.89$

   D. $k = 288.89$

   E. None of the above.

---

7. A town has an initial population of 100000. The town's population for the next 9 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	100020	100040	100060	100080	100100	100120	100140	100160	100

   A. Non-Linear Power

   B. Logarithmic

   C. Linear

   D. Exponential

   E. None of the above

8. Choose the model type that would best describe the scenario below.

Big O notation is common in computer science to describe how fast a program can solve a particular problem. Big O notation categorizes functions according to their growth rates, the same way we have categorized modeling real-world problems by certain types of functions. When analyzing a particular program, a student found the computer to need x^x time to complete, where x was the number of inputs into the program.

A. Indirect variation

B. Joint variation

C. Direct variation

D. None of the above

9. For the scenario below, find the variation constant k of the model (if possible).

In an alternative galaxy, the cube of the time, T (Earth years), required for a planet to orbit Sun χ decreases as the square of the distance, d (AUs), that the planet is from Sun χ decreases. For example, when Ea's average distance from Sun χ is 3, it takes 72 Earth days to complete an orbit.

A. $k = 2.402$

B. $k = 41472.000$

C. $k = 3359232.000$

D. $k = 4.028$

E. Unable to compute the constant based on the information given.

10. For the scenario below, find the variation constant k of the model (if possible).

In an alternative galaxy, the cube of the time, T (Earth years), required for a planet to orbit Sun χ increases as the cube of the distance, d (AUs), that the planet is from Sun χ increases. For example, when Ea's average distance from Sun χ is 6, it takes 99 Earth days to complete an orbit.

A. $k = 209584584.000$

B. $k = 4492.125$

C. $k = 4.028$

D. $k = 2.546$

E. Unable to compute the constant based on the information given.
