This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

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1. Solve the modeling problem below, if possible.

   A new virus is spreading throughout the world. There were initially 3 many cases reported, but the number of confirmed cases has tripled every 4 days. How long will it be until there are at least 10000 confirmed cases?

   The solution is About 30 days, which is option C.

   A. About 18 days

      You modeled the situation with e as the base and did not apply the properties of log correctly.

   B. About 33 days

      You modeled the situation with e as the base, but solved correctly otherwise.

   C. About 30 days

      * This is the correct option.

   D. About 17 days

      You modeled the situation correctly but did not apply the properties of log correctly.

   E. There is not enough information to solve the problem.

      If you chose this option, please contact the coordinator to discuss why you think this is the case.

   General Comment: Set up the model the same as in Module 11M. Then, plug in 10000 and solve for d in your model.

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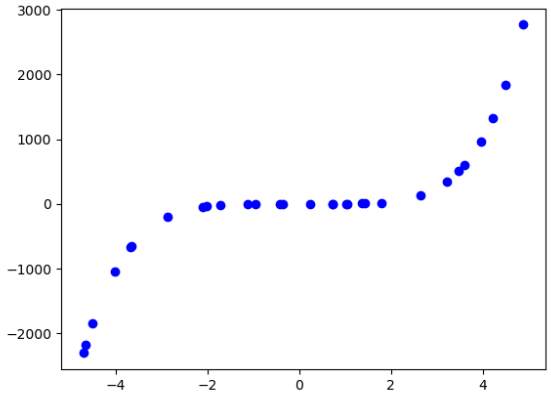
2. Determine the appropriate model for the graph of points below.



   The solution is Non-linear Power model, which is option A.

A. Non-linear Power model

For this to be the correct option, we need to see a polynomial or rational shape.

B. Logarithmic model

For this to be the correct option, we want a rapid change early, then an extremely slow change later.

C. Linear model

For this to be the correct option, we need to see a mostly straight line of points.

D. Exponential model

For this to be the correct option, we want an extremely slow change early, then a rapid change later.

E. None of the above

For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

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3. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 50 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

The solution is About 14 percent, which is option B.

A. About 4 percent

This corresponds to not solving for the increase properly.

B. About 14 percent

* This is the correct option.

C. About 22 percent

This corresponds to solving correctly but treating both radius and height as equal contributors to the volume.

D. About 25 percent

This corresponds to treating both radius and height as equal contributors and not solving correctly.

E. None of the above

If you chose this, please contact the coordinator to discus how you solved the problem.

General Comment: Remember that when plugging the increases of values in, you need to treat it as that percentage above 100. For example, a 5 percent increase means 105 percent.

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4. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 4 many cases reported, but the number of confirmed cases has doubled every 1 days. How long will it be until there are at least 100000 confirmed cases?

The solution is About 15 days, which is option B.

A. About 5 days

You modeled the situation with e as the base and did not apply the properties of log correctly.

B. About 15 days

* This is the correct option.

C. About 6 days

You modeled the situation correctly but did not apply the properties of log correctly.

D. About 11 days

You modeled the situation with e as the base, but solved correctly otherwise.

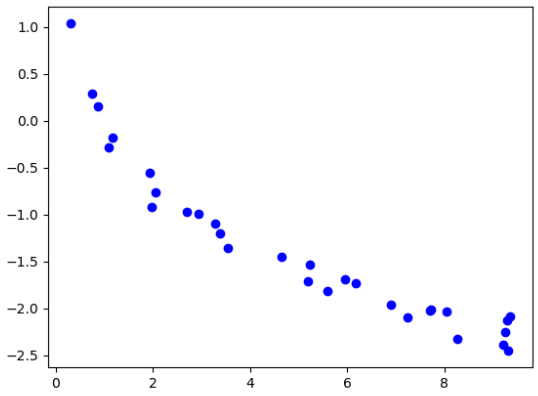
E. There is not enough information to solve the problem.

If you chose this option, please contact the coordinator to discuss why you think this is the case.

General Comment: Set up the model the same as in Module 11M. Then, plug in 100000 and solve for d in your model.

---

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



The solution is Logarithmic model, which is option C.

A. Linear model

For this to be the correct option, we need to see a mostly straight line of points.

B. Non-linear Power model

For this to be the correct option, we need to see a polynomial or rational shape.

C. Logarithmic model

For this to be the correct option, we want a rapid change early, then an extremely slow change later.

D. Exponential model

For this to be the correct option, we want an extremely slow change early, then a rapid change later.

E. None of the above

For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

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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 190° *C and is placed into a* 16° *C bath to cool. After 10 minutes, the uranium has cooled to* 126° *C.*

The solution is None of the above, which is option E.

A. $k = -0.07524$

This uses A as the initial temperature and solves for k incorrectly.

B. $k = -0.05465$

This uses A as the initial temperature and solves for k correctly.

C. $k = -0.05465$

This uses A as the initial temperature and solves for k incorrectly.

D. $k = -0.07632$

This uses A correctly and solves for k incorrectly.

E. None of the above

* This is the correct answer as $k = -0.04586$.

General Comment: The initial temperature is when $t = 0$. Unlike power models, that means A is not the initial temperature!

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7. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 34 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

The solution is About 10 percent, which is option D.

A. About 3 percent

This corresponds to not solving for the increase properly.

B. About 17 percent

This corresponds to treating both radius and height as equal contributors and not solving correctly.

C. About 16 percent

This corresponds to solving correctly but treating both radius and height as equal contributors to the volume.

D. About 10 percent

* This is the correct option.

E. None of the above

If you chose this, please contact the coordinator to discus how you solved the problem.

General Comment: Remember that when plugging the increases of values in, you need to treat it as that percentage above 100. For example, a 5 percent increase means 105 percent.

---

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

In an alternative galaxy, the quartic of the time, T (Earth years), required for a planet to orbit Sun χ decreases as the cube of the distance, d (AUs), that the planet is from Sun χ decreases. For example, when Ea's average distance from Sun χ is 8, it takes 74 Earth days to complete an orbit.

The solution is $k = 58567.531$, which is option C.

A. $k = 15353126912.000$

This corresponds to the model $T^4 = \dfrac{k}{d^3}$.

B. $k = 1.466$

This corresponds to the model $T^{1/4} = kd^{1/3}$.

C. $k = 58567.531$

* This is the correct option corresponding to the model $T^4 = kd^3$.

D. $k = 4.028$

This copies the constant used in the homework.

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

This corresponds to believing you cannot determine the type of model from the information given.

General Comment: Since T decreases proportionally as d decreases, we know this is a direct variation model.

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9. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 29 liter 28 percent solution of chemical χ using two different solution percentages of chemical χ. When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 16 percent and 43 percent solutions, what was the amount she used of the 16 percent solution?

The solution is 16.11, which is option B.

A. 14.50

This would be correct if Brittany used equal parts of each solution.

B. 16.11

*This is the correct option.

C. 12.89

This is the concentration of 43 percent solution.

D. 12.63

This was a random value. If this was not a guess, contact the coordinator to talk about how you got this value.

E. There is not enough information to solve the problem.

You may have chose this if you thought you needed to know how much of the second solution was used in the problem. Remember that the total minus the first solution would give you the second amount used.

General Comment: Build the model exactly as you did in Module 9M. Then, solve for the volume you are looking for.

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10. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 28 liter 24 percent solution of chemical χ using two different solution percentages of chemical χ. When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 14 percent and 36 percent solutions, what was the amount she used of the 36 percent solution?

The solution is 12.73, which is option C.

A. 15.27

This is the concentration of 14 percent solution.

B. 14.95

This was a random value. If this was not a guess, contact the coordinator to talk about how you got this value.

C. 12.73

*This is the correct option.

D. 14.00

This would be correct if Brittany used equal parts of each solution.

E. There is not enough information to solve the problem.

You may have chose this if you thought you needed to know how much of the second solution was used in the problem. Remember that the total minus the first solution would give you the second amount used.

General Comment: Build the model exactly as you did in Module 9M. Then, solve for the volume you are looking for.
