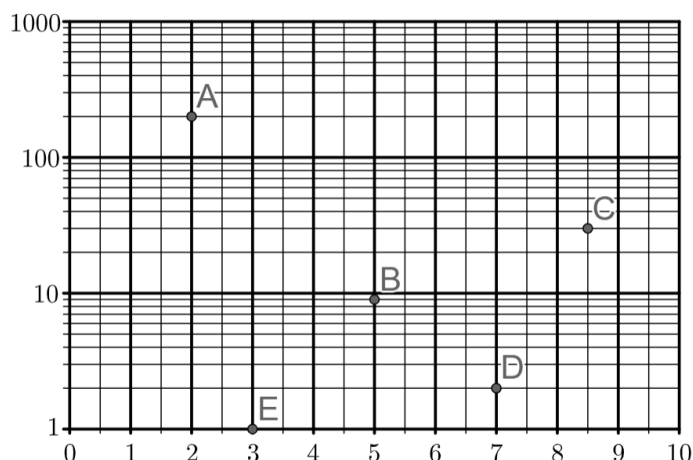


Semi-log Plots (2.15) Homework

Pro-tip: if you use a tutor to help reinforce your AP Precalculus learning, consider sending these problems to your tutor ahead of time. It's possible your tutor has never taught this topic before. They might want to have a head start in thinking about how to phrase explanations.

- Consider the plot given to the right. The vertical axis is scaled logarithmically using a common log. Find the coordinates of points A, B, D, and E.



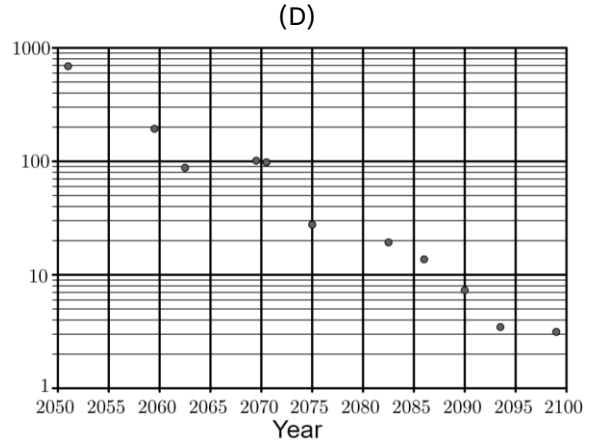
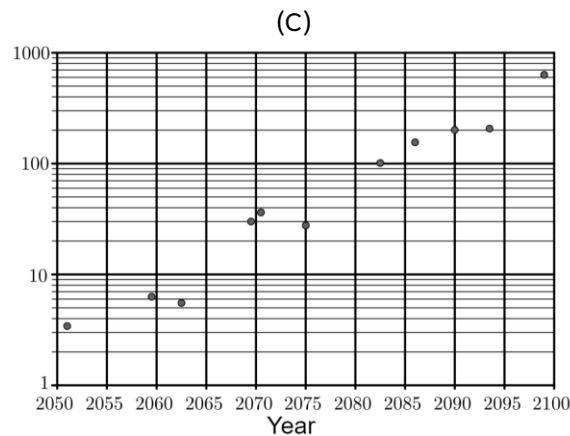
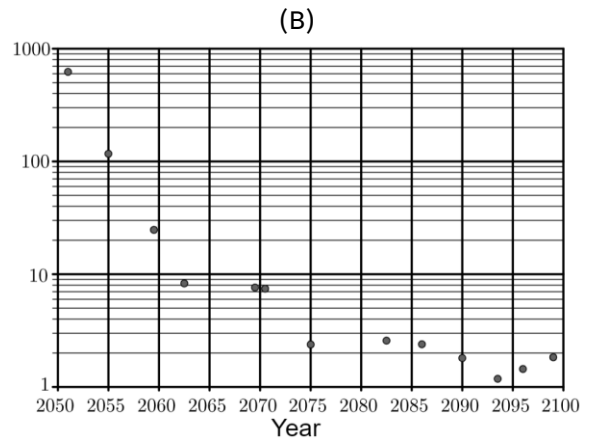
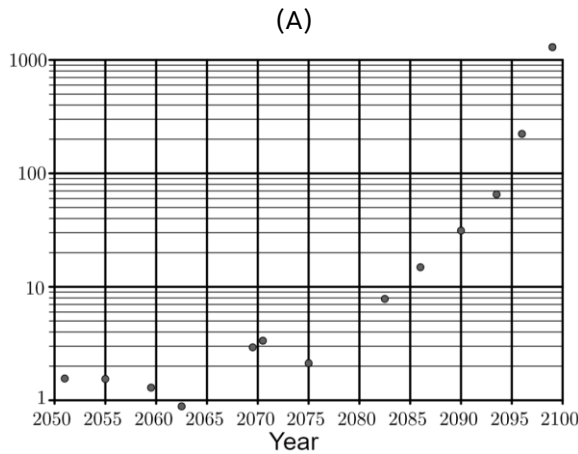
- A data set that appears exponential is modeled by the function f given by $f(x) = 6\left(\frac{1}{2}\right)^x$. When the data are represented using a semi-log plot, where the vertical axis is scaled using the common log, a linear pattern is apparent. What is the apparent slope of that linear pattern?
- A data set that appears exponential is modeled by the function g given by $g(x) = 4(5)^x$. When the data are represented using a semi-log plot, where the vertical axis is scaled using the natural log, a linear pattern is apparent. Find the initial-value of the linear model of the semi-log plot.

Question #4 and #5 are not immediately related to semi-log plots. But that doesn't make them any less fun.

- Solve: $(4^x)^2 - 4^x - 6 = 0$.
- Solve: $(\ln x)^2 - 3(\ln x) + 2 \geq 0$
- A data set is well modeled by the function h . When the data are represented using a semi-log plot, a linear pattern is apparent. Which of the following could give the function h ? Select all that apply.

(A) $h(x) = 4x - 3$	(E) $h(x) = 4\left(\frac{1}{3}\right)^x$
(B) $h(x) = 4^{x-3}$	(F) $h(x) = x^4 - 3$
(C) $h(x) = \log_4(x - 3)$	(G) $h(x) = \sqrt[3]{4x}$
(D) $h(x) = 3(4)^x$	(H) $h(x) = \log_3(x^4)$
- A data set that appears exponential is modeled by the function f . When the data are represented using a semi-log plot, where the vertical axis is scaled using a log base 2, a linear pattern is apparent. The linear model corresponding with the semi-log plot has equation $y = 4x - 1$. Find an expression for f in the form $f(x) = ab^x$.

8. A data set is well modeled by the function k . When the data are represented using a semi-log plot, a linear pattern with a positive rate of change is apparent. Which one of the following could give the function k ?
- (A) $k(x) = 6\left(\frac{1}{2}\right)^x$
 (B) $k(x) = \frac{1}{2}(6)^x$
 (C) $k(x) = \log_6\left(\frac{x}{2}\right)$
 (D) $k(x) = 6\log_2(x)$
9. In the 1999 film “Zenon: Girl of the 21st Century,” Zenon Kar says “Yeah, we just barter with alien skulls” to explain why she is unfamiliar with earth’s money. To help others in her situation, Judy spends years tracking the earth dollar value of one alien skull. She concludes that the value of alien skulls as a function of time is best modeled with an exponential growth function. Which one of the following could represent Judy’s data in a semi-log plot, where the vertical axis is scaled logarithmically?



Question #10 and #11 are not semi-log plot questions, but sometimes it’s fun to color outside the lines.

10. Let $f(x) = (\ln x)^2 - 4 \ln x$. Find all values in the domain of f that yield an output value of 12.

11. Let $g(x) = (9^x)^2 - 3(9^x)$. Find all values in the domain of g that yield negative output values.

Semi-log Plot HW Answers

1. A (2,200)
B (5,9)
C (8.5,30)
D (7,2)
E (3,1)
2. $\log\left(\frac{1}{2}\right)$ (note: if you wanted to call this $-\log 2$, you could)
3. $\ln(4)$
4. $x = \log_4 3$
5. $(0, e] \cup [e^2, \infty)$
6. B, D, E
7. $f(x) = \frac{1}{2}(16)^x$
8. B
9. C
10. $x = \frac{1}{e^2}, x = e^6$
11. $\left(-\infty, \frac{1}{2}\right)$