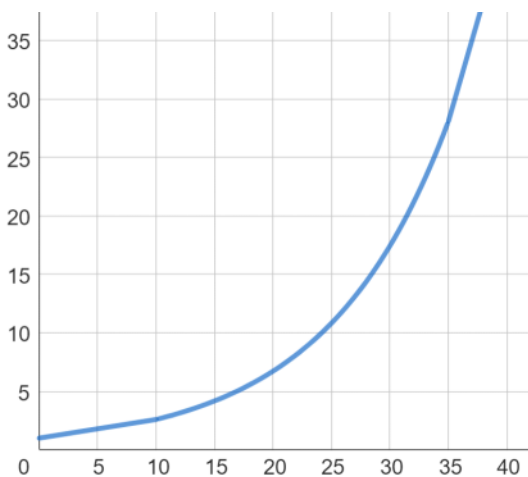
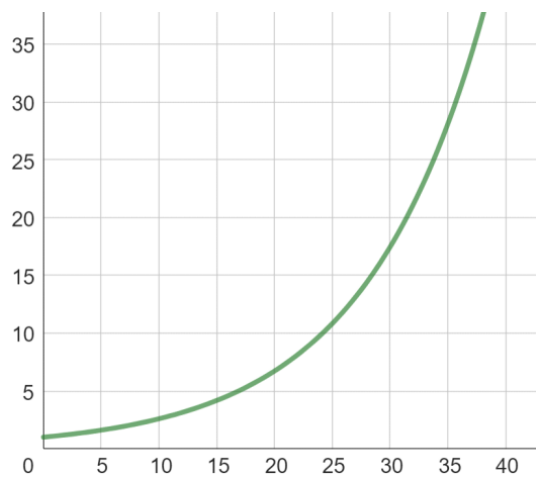


What is the difference between the two graphs?



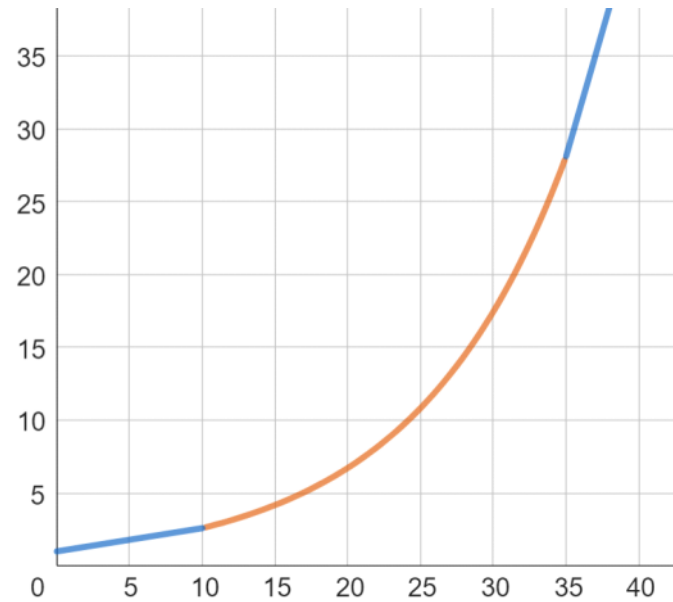
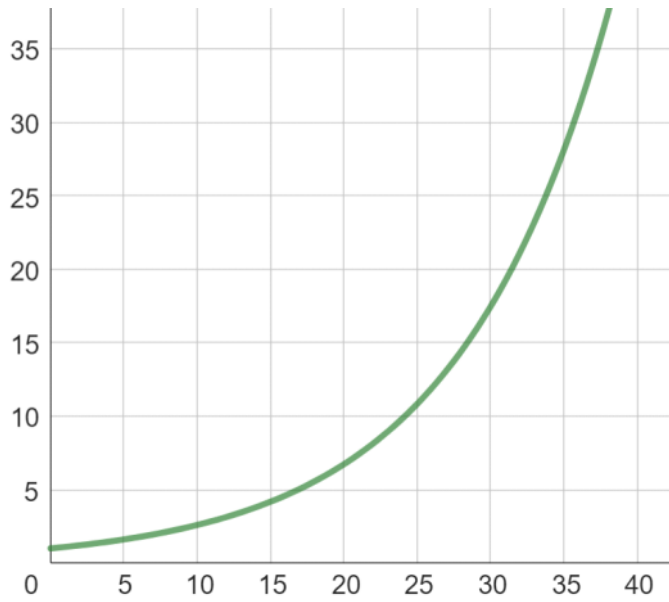
Log Functions Day 7: (2.15) Semi-log Plots

Homework: Semi-log Plots

Quiz Next Class:

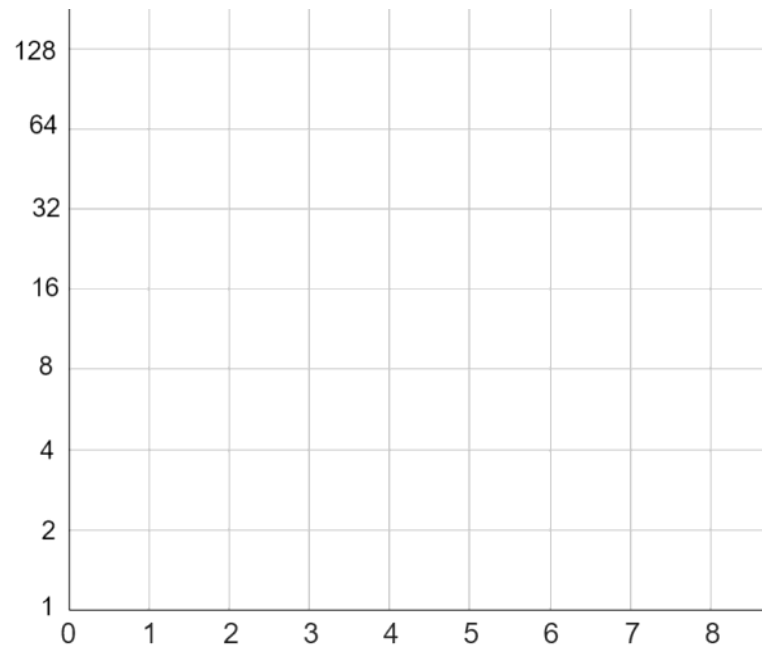
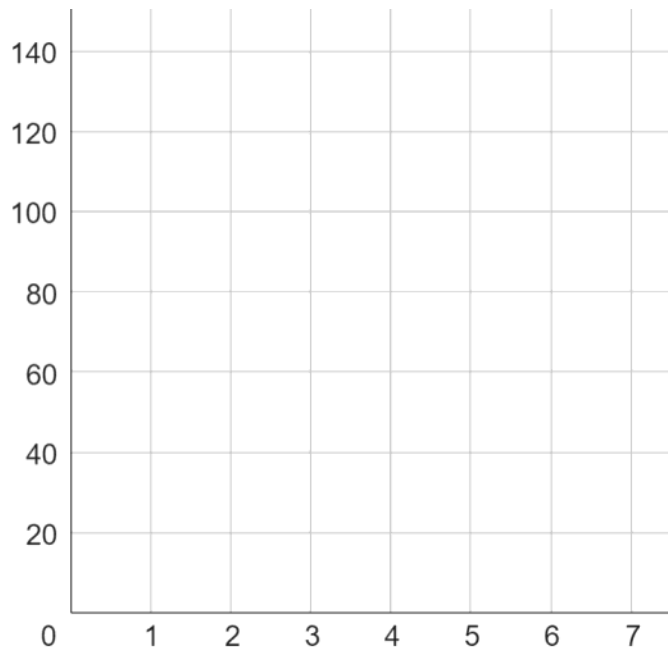
- Solving Log Equations
- Solving Log Inequalities
- Solving Exponential Equations
- Solving Exponential Inequalities
- Finding inverses of log/exponential functions

The one on the right was linear at the edges! We couldn't even tell! Why couldn't we tell?

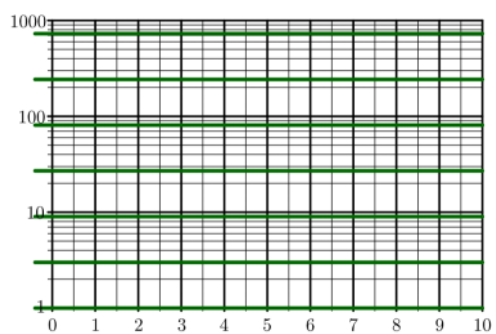
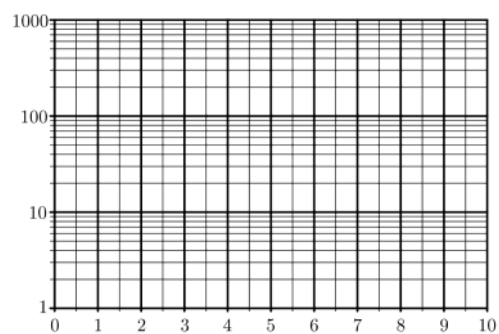


Graphing with Linear Scale vs Graphing with Logarithmic Scale

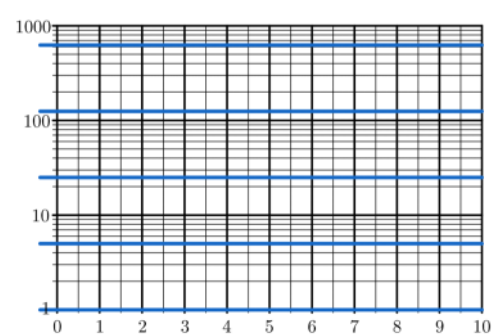
Let's graph $f(x) = 2^x$



On a semi-log plot, equally spaced vertical axis values are proportional.

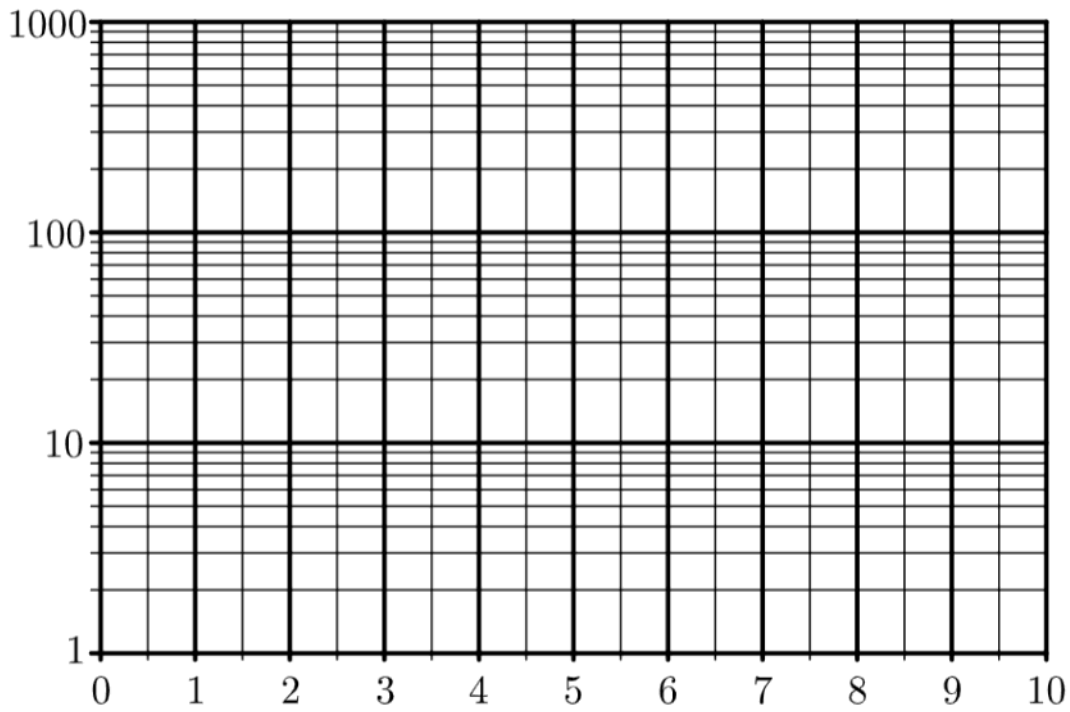


Green lines at 1, 3, 9, 27, 81, 243, 729



Blue lines at 1, 5, 25, 125, 625

Let's practice plotting points



Plot:

A) $(5, 3)$

B) $(8, 120)$

C) $(4.5, 100)$

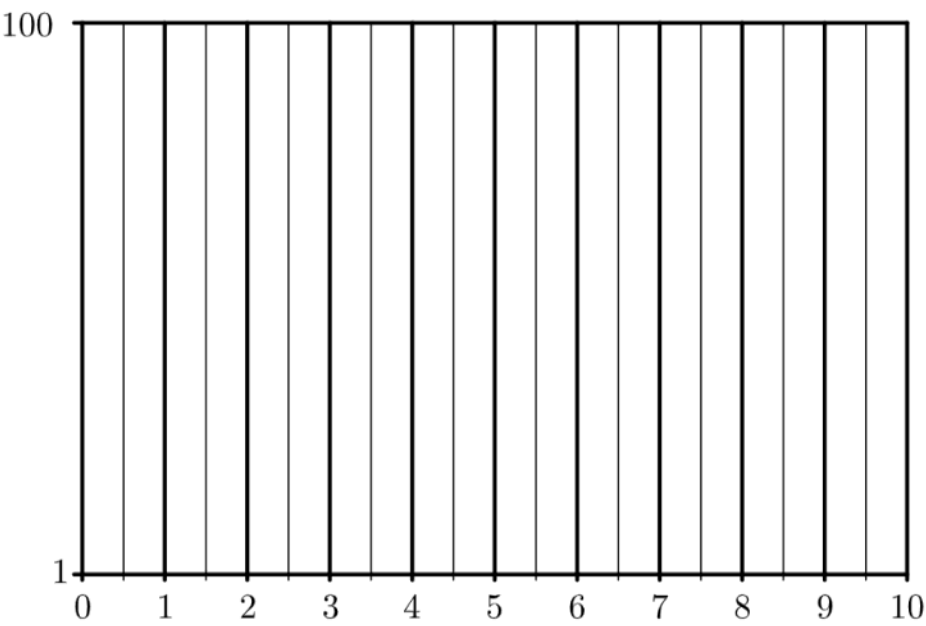
D) $(2, 1)$

E) $(1, 80)$

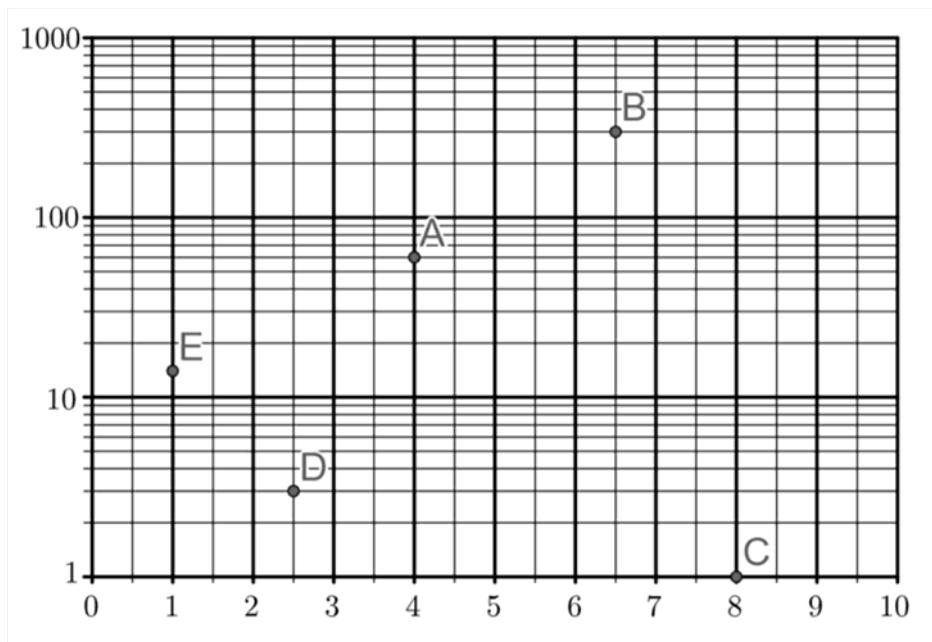
F) $(9, -1)$

Let's practice plotting points

Plot the point (3,50)



Let's practice reading points



Find the coordinates for each point.

$A =$

$B =$

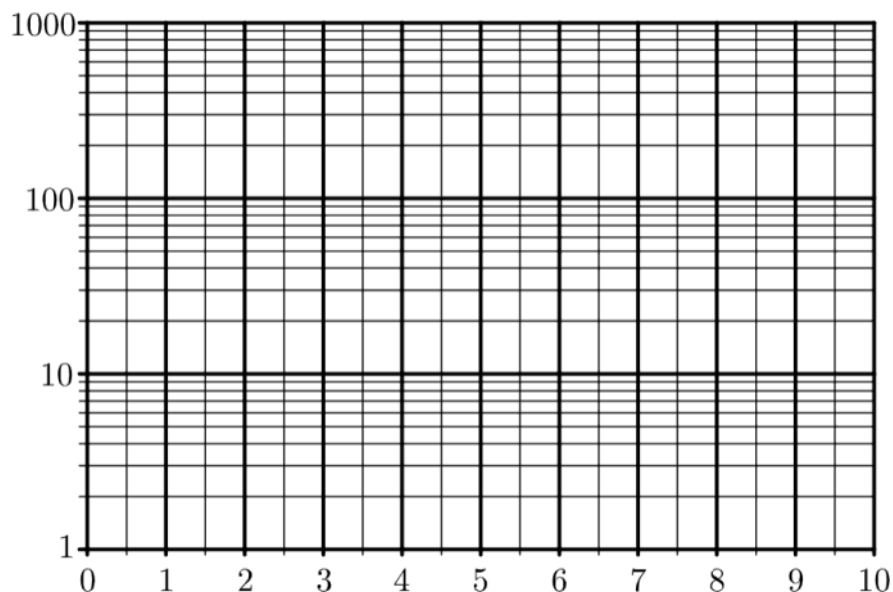
$C =$

$D =$

$E =$

Useful things about semi-log plots

- Useful thing #1: You can see the difference in output values for small or large input values to exponential functions.
- Useful thing #2: Exponential functions appear linear. So, if data appears linear on a semi-log plot, you know the data could be modeled well by an exponential function!



Plot:

A) (0,800)

G) (6,70)

B) (1,550)

H) (7,50)

C) (2,360)

I) (8,30)

D) (3,240)

J) (9,20)

E) (4,160)

K) (10,15)

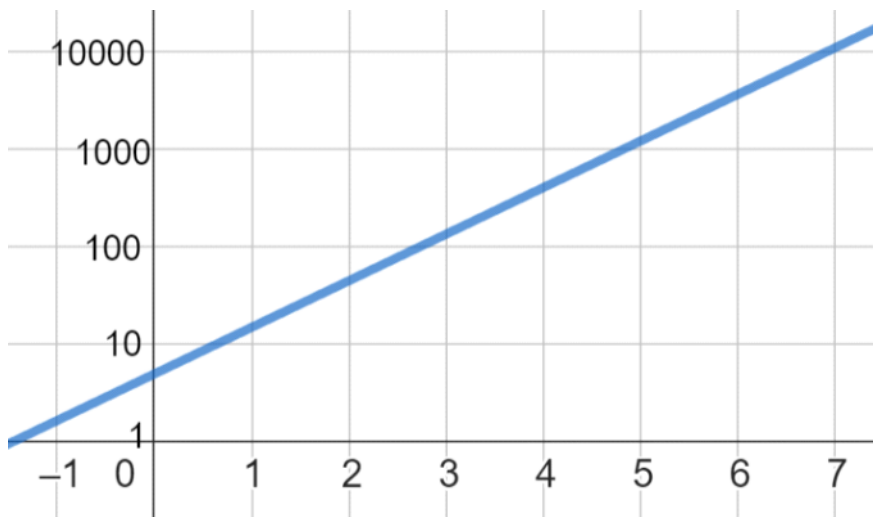
F) (5,106)

There are only about 4 things you need to know about semi-log plots, so at the risk of repeating myself...

- If you have data that follows an exponential model, the semi-log plot will appear linear
- If the semi-log plot appears linear, you have data that will follow an exponential model.

A little less talking and a little more math...

Check out this graph of $f(x) = 5(3)^x$ plotted with a logarithmic vertical scale.



I wonder what the slope and y-intercept of this line are...

There are only about 4 things you need to know about semi-log plots, so at the risk of repeating myself...

- If you have data that follows an exponential model, the semi-log plot will appear linear.
- If the semi-log plot appears linear, you have data that will follow an exponential model.
- For $y = ab^x$, the corresponding linear model has slope $\log_n b$ (where $n > 0$ is whatever is the ratio between your equally spaced vertical axis tick marks)
- For $y = ab^x$, the corresponding linear model has initial value $\log_n a$ (where $n > 0$ is whatever is the ratio between your equally spaced vertical axis tick marks)

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 base 3 logarithm, a linear pattern is apparent. The linear model corresponding with the semi-log plot has equation $y = 2x + 1$. Find an expression for f in the form $f(x) = ab^x$

A data set that appears exponential is modeled by the function f given by $f(x) = ab^x$. When the data are represented use a semi-log plot, where the vertical-axis is scaled use a natural log, a linear pattern is apparent.

If the slope of the linear pattern is negative, what does that imply about the value of b ?

A data set that appears exponential is modeled by the function f given by $f(x) = ab^x$. When the data are represented use a semi-log plot, where the vertical-axis is scaled use a natural log, a linear pattern is apparent.

If the initial value of the linear model is positive, what does that imply about the value of a ?

A data set that appears exponential is modeled by the function f given by $f(x) = ab^x$. When the data are represented use a semi-log plot, where the vertical-axis is scaled use a log base 5, a linear pattern is apparent.

If the slope of the linear pattern is 2, find the value of b

A data set that appears exponential is modeled by the function f given by $f(x) = ab^x$. When the data are represented use a semi-log plot, where the vertical-axis is scaled use a log base 5, a linear pattern is apparent.

If the initial value of the linear model is $\frac{1}{2}$, find the value of a