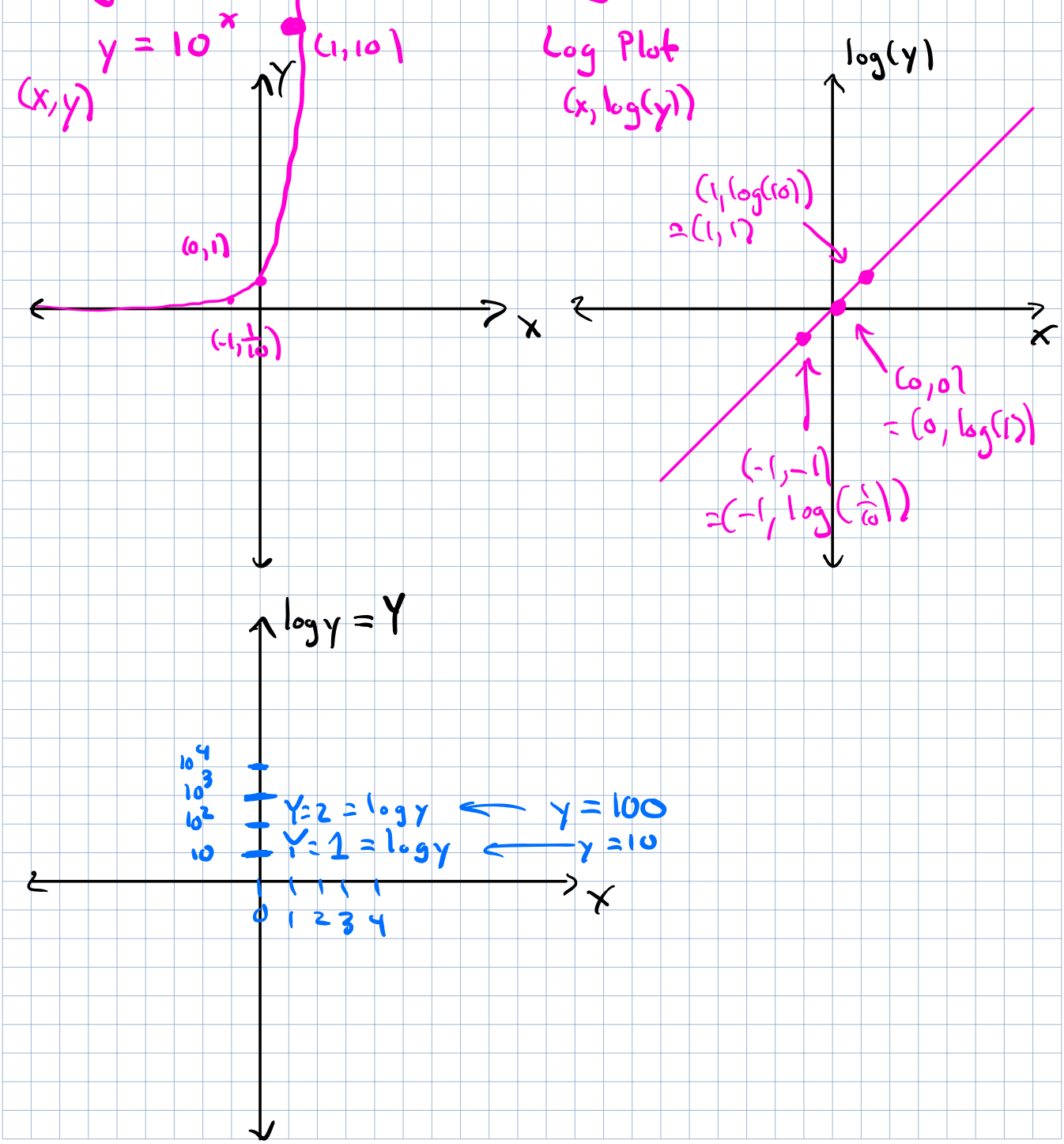
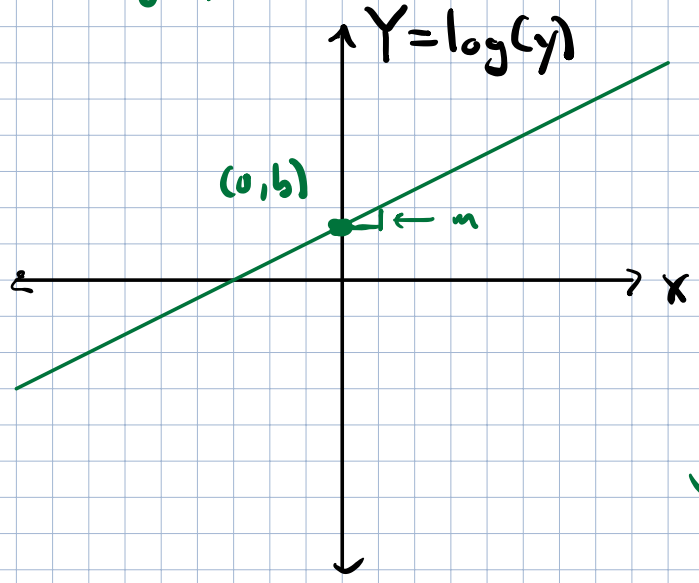
Exam 1 - Wednesday, February 2nd IN CLASS

Please get your DRC letters to me by the end of the week

Log Plots (or Semilog Plots)



If a function looks linear when graphed on a log plot, what kind of function is it?



$$Y = mx + b$$

$$\log(y) = mx + b$$

$$y = 10^{mx+b}$$

$$y = 10^b \cdot 10^{mx}$$

$$= 10^b \cdot (10^m)^x$$

$y = a \cdot c^x$, where $a = 10^b$ and $c = 10^m$.

Going backwards, if $y = a \cdot c^x$ is an exponential function, then the graph of this function on a log plot will be a line with y-intercept $b = \log(a)$ and slope $m = \log(c)$.

Ex: If you graph the function $y = 5 \cdot 2^x$ on a semilog plot, you get a line with

y-intercept $\log(5)$ and slope $\log(2)$.

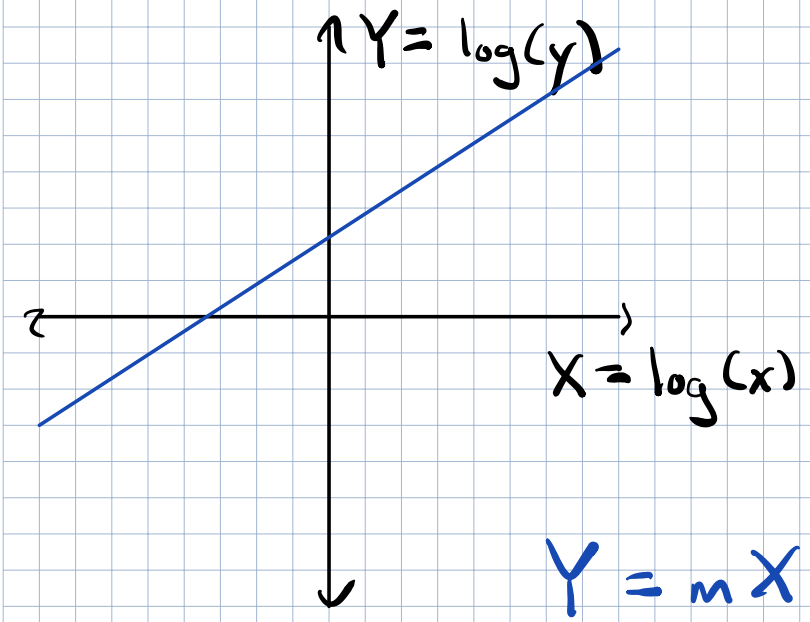
Ex: Let $y = a \cdot c^x$ be an exponential function. Suppose, when you graph this function on a log plot, you get a line with y-intercept 5 and slope 7. What is the function?

$a = 10^5 = 100{,}000$

$c = 10^7 = 10{,}000{,}000$

$y = 10^5 \cdot (10^7)^x$.

Double-Log Plots (or Log-Log Plots)



Suppose a function $y = f(x)$ is a line when plotted on a double log plot. What kind of function is it?

$$Y = mX + b$$

$$\log(y) = m \cdot \log(x) + b$$

$$10^{\log(y)} = 10^{m\cdot\log(x)+b}$$

$$y = 10^{b}\cdot 10^{m\cdot\log(x)}$$

$$y = 10^{b}\cdot 10^{\log(x^m)}$$

$$y = 10^{b}\cdot x^{m}$$

This is a power function.

$y = a\cdot x^{m}$, where $a = 10^{b}$ and $m = m$.

Going backwards: If you have a power function $y = a\cdot x^{m}$, then when you plot it on a double log plot, you get a line with y-intercept $b = \log(a)$ and slope m.

Ex: If you plot $y = 100\cdot x^{3}$ on a double log plot, you get a line with y-intercept $\log(100) = 2$ and slope 3.

Ex: If the graph of the function $y = f(x)$ on a double log plot is a line with y-intercept 1 and slope 5, what is $f(x)$?

It's a power function $f(x) = a \cdot x^m$,
where $a = 10^1 = 10$ and $m = 5$.
$f(x) = 10x^5$.