Optical Sensor (2C)

- Logarithmic Scale
- Photometric Unit

Please send corrections (or suggestions) to youngwlim@hotmail.com.

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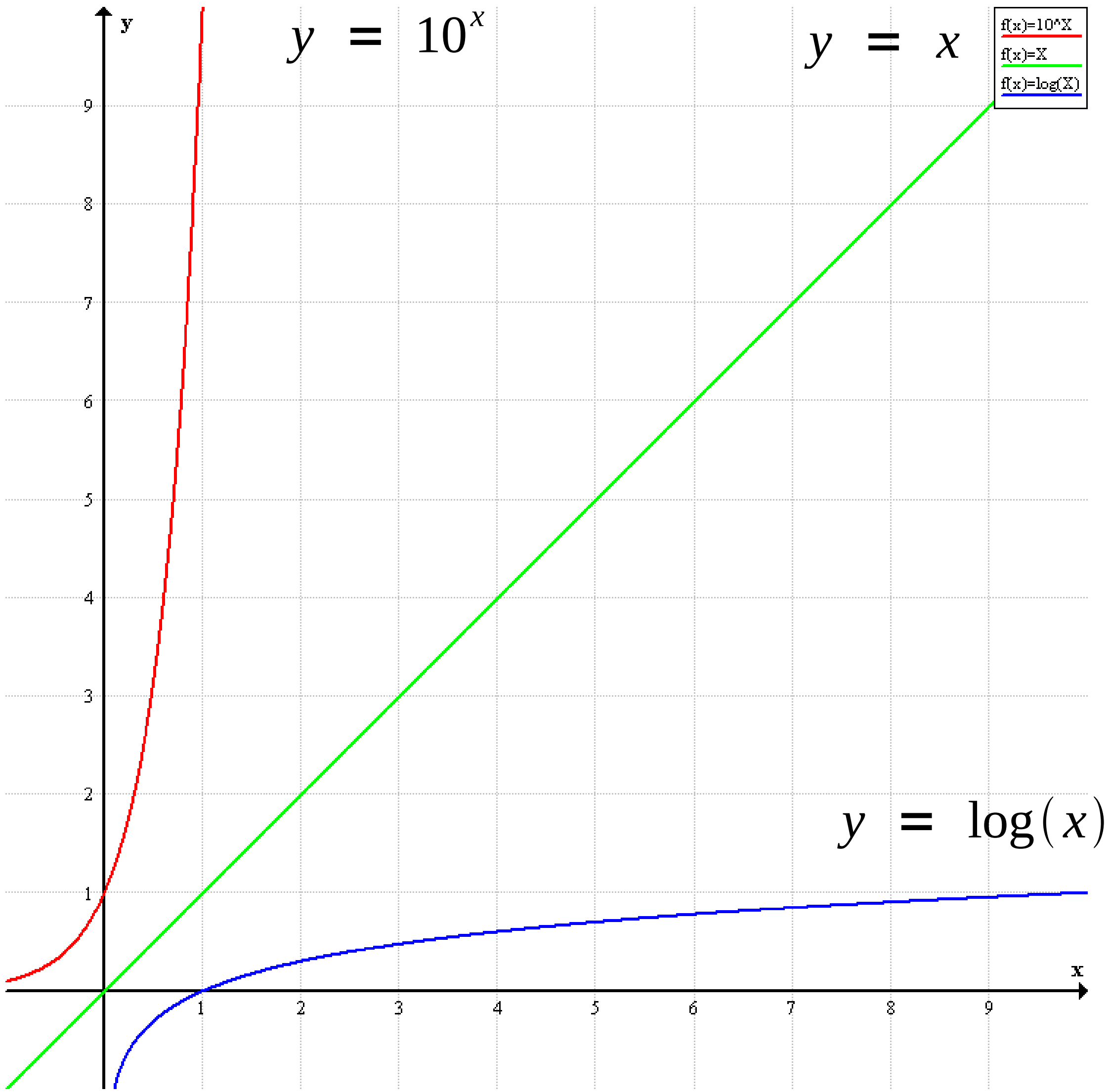
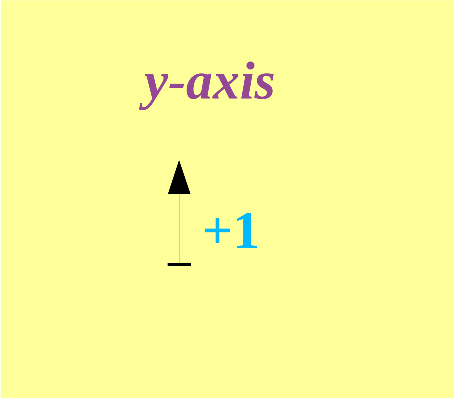
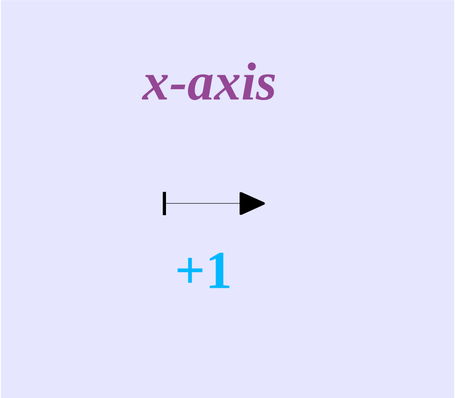
Linear – Linear Scale

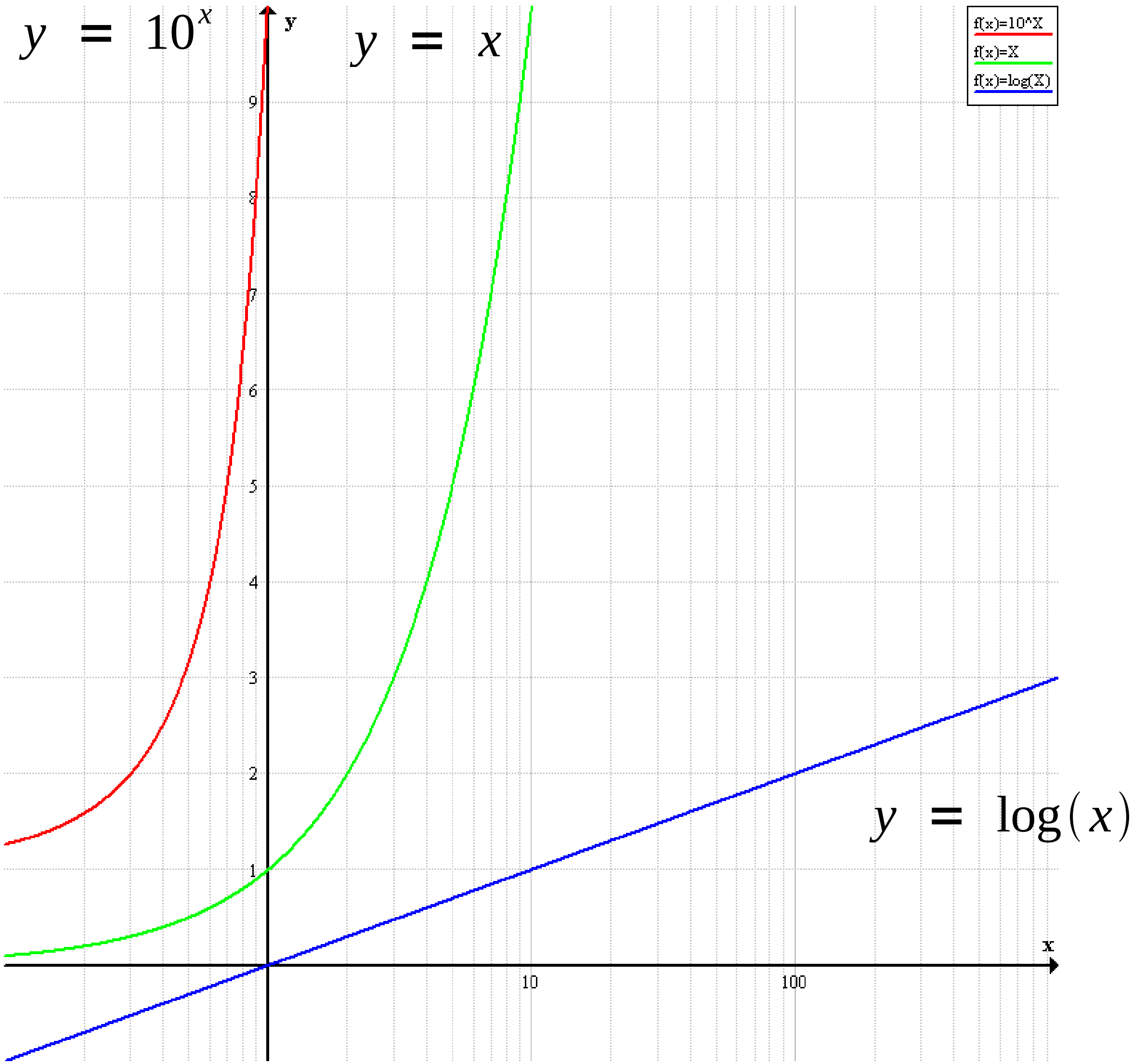


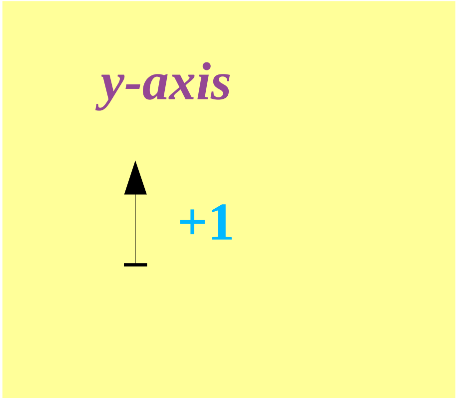


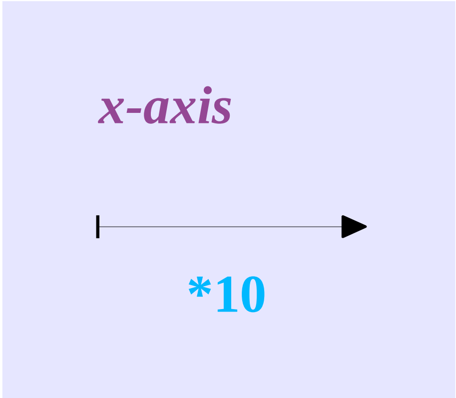


** A picture from Wikipedia*

Linear – Log Scale

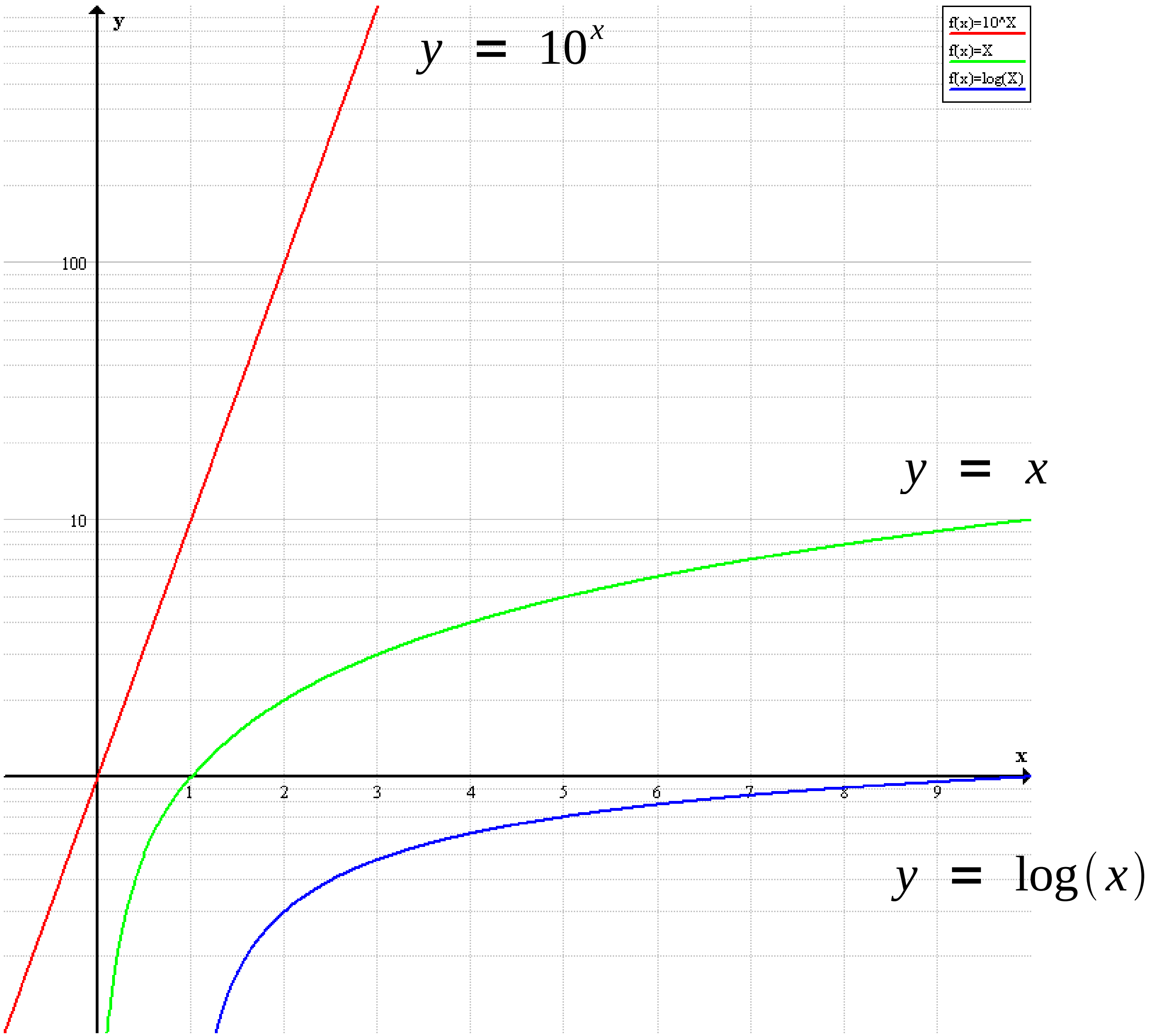


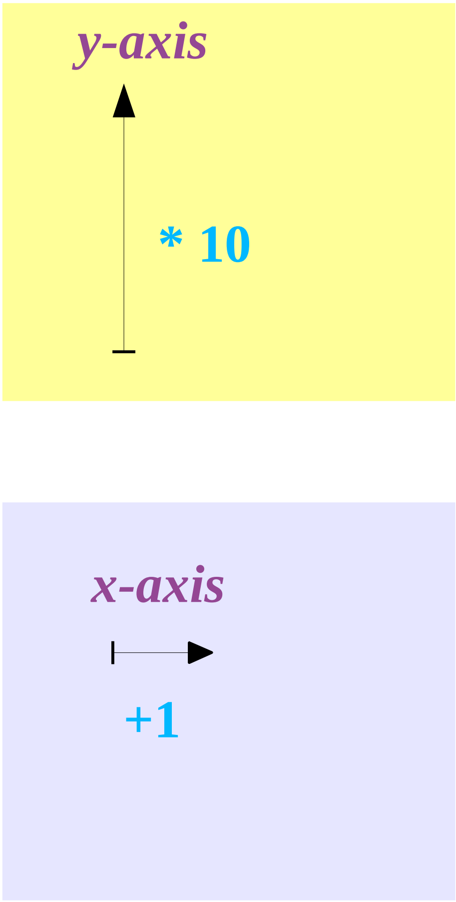




** A picture from Wikipedia*

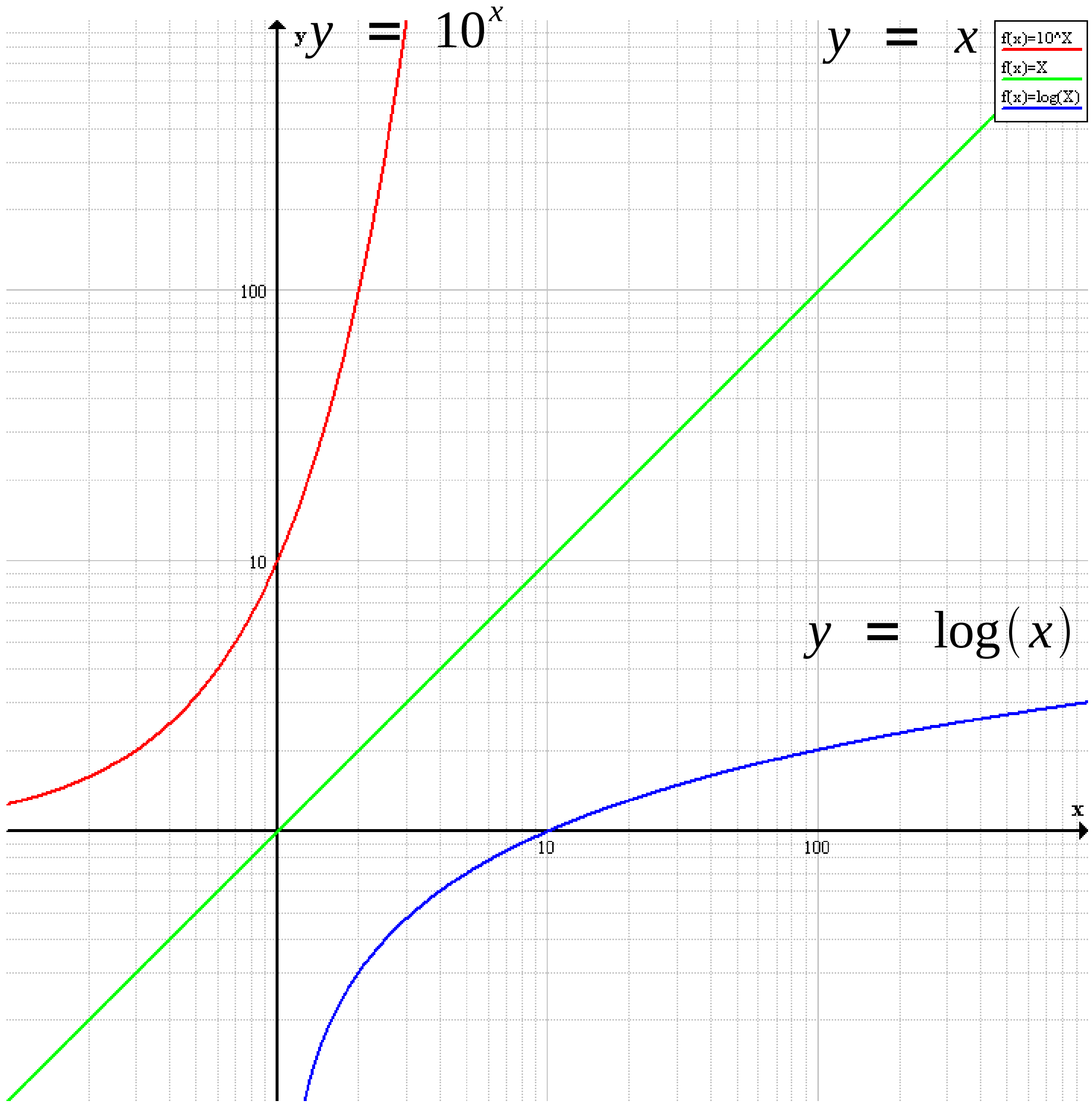
Log – Linear Scale

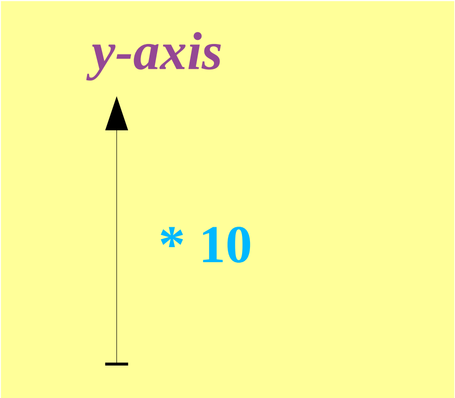


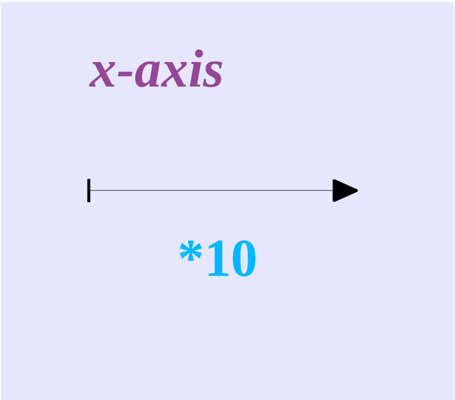


* A picture from Wikipedia

Log – Log Scale



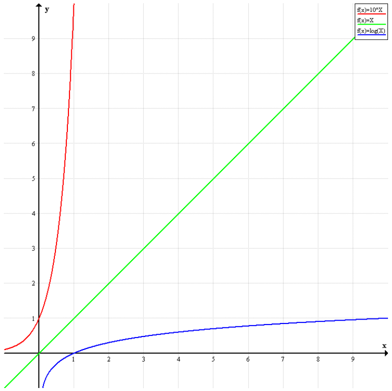




** A picture from Wikipedia*

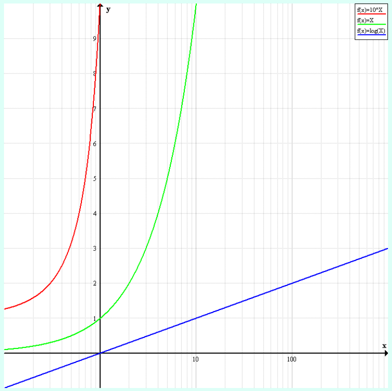
Logarithmic and Semi-logarithmic Plots

Linear



Linear

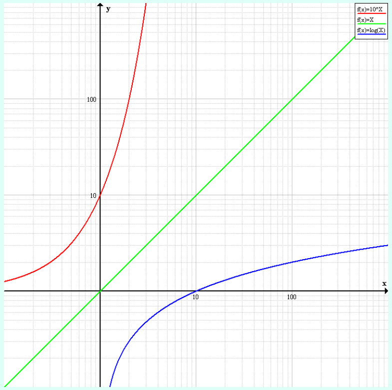
Linear



Log

Logarithmic plots

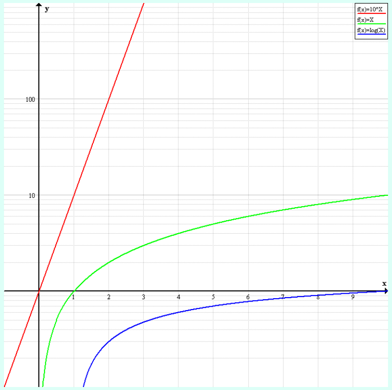
Log



Log

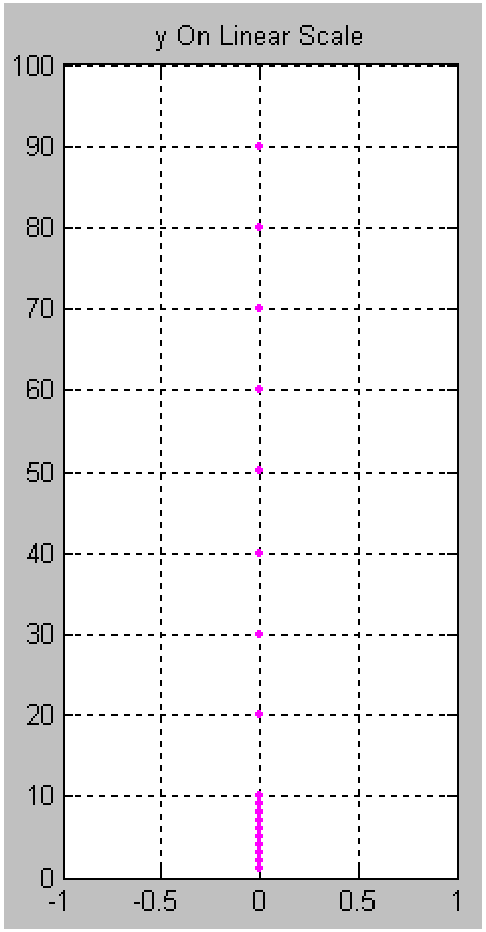
Semi-logarithmic plots

Log



Linear

Linear Scale Plot Example



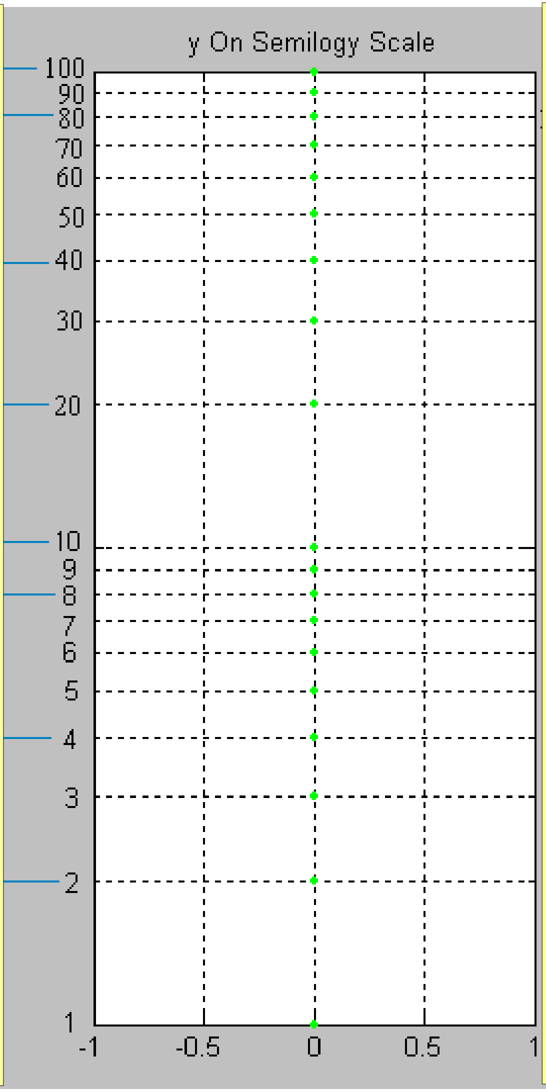
Data points

- *0*
- *1*
- *2*
- *3*
- *4*
- *5*
- *6*
- *7*
- *8*
- *9*
- *10*

- *20*
- *30*
- *40*
- *50*
- *60*
- *70*
- *80*
- *90*
- *100*

** A picture from Wikipedia*

Semi-logarithmic Scale Plot Example (1)



Data points

- ***0***
- ***1***
- ***2***
- ***3***
- ***4***
- ***5***
- ***6***
- ***7***
- ***8***
- ***9***
- ***10***

- ***20***
- ***30***
- ***40***
- ***50***
- ***60***
- ***70***
- ***80***
- ***90***
- ***100***

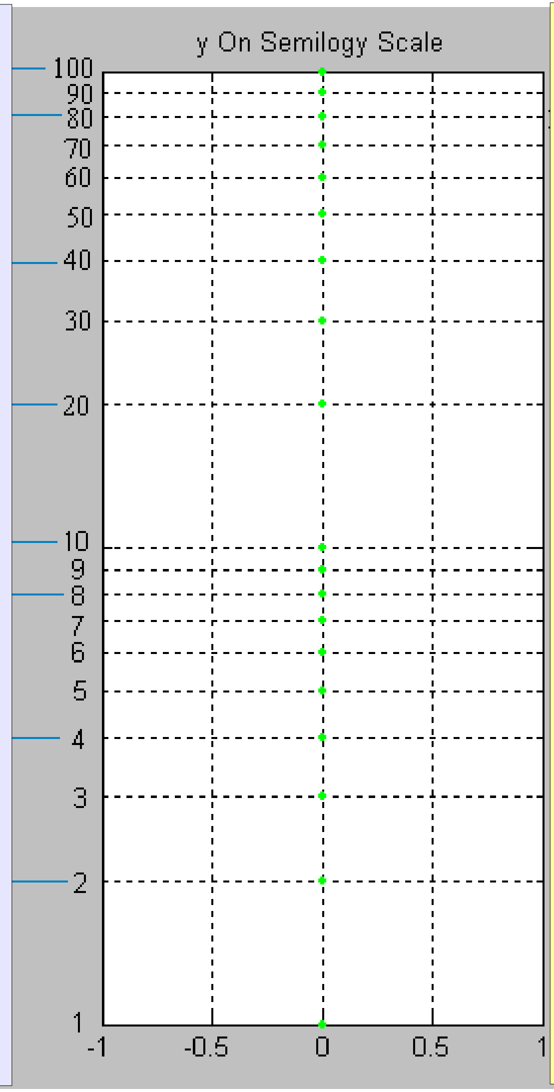
** A picture from Wikipedia*

Semi-logarithmic Scale Plot Example (2)

Log values

- *Log(1) = 0.00*
- *Log(2) = 0.31*
- *Log(3) = 0.47*
- *Log(4) = 0.60*
- *Log(5) = 0.70*
- *Log(6) = 0.78*
- *Log(7) = 0.85*
- *Log(8) = 0.90*
- *Log(9) = 0.95*
- *Log(10) = 1.0*

- *Log(20) = 1.31*
- *Log(30) = 1.47*
- *Log(40) = 1.60*
- *Log(50) = 1.70*
- *Log(60) = 1.78*
- *Log(70) = 1.85*
- *Log(80) = 1.90*
- *Log(90) = 1.95*
- *Log(100) = 2.0*



Data points

- *0*
- *1*
- *2*
- *3*
- *4*
- *5*
- *6*
- *7*
- *8*
- *9*
- *10*

- *20*
- *30*
- *40*
- *50*
- *60*
- *70*
- *80*
- *90*
- *100*

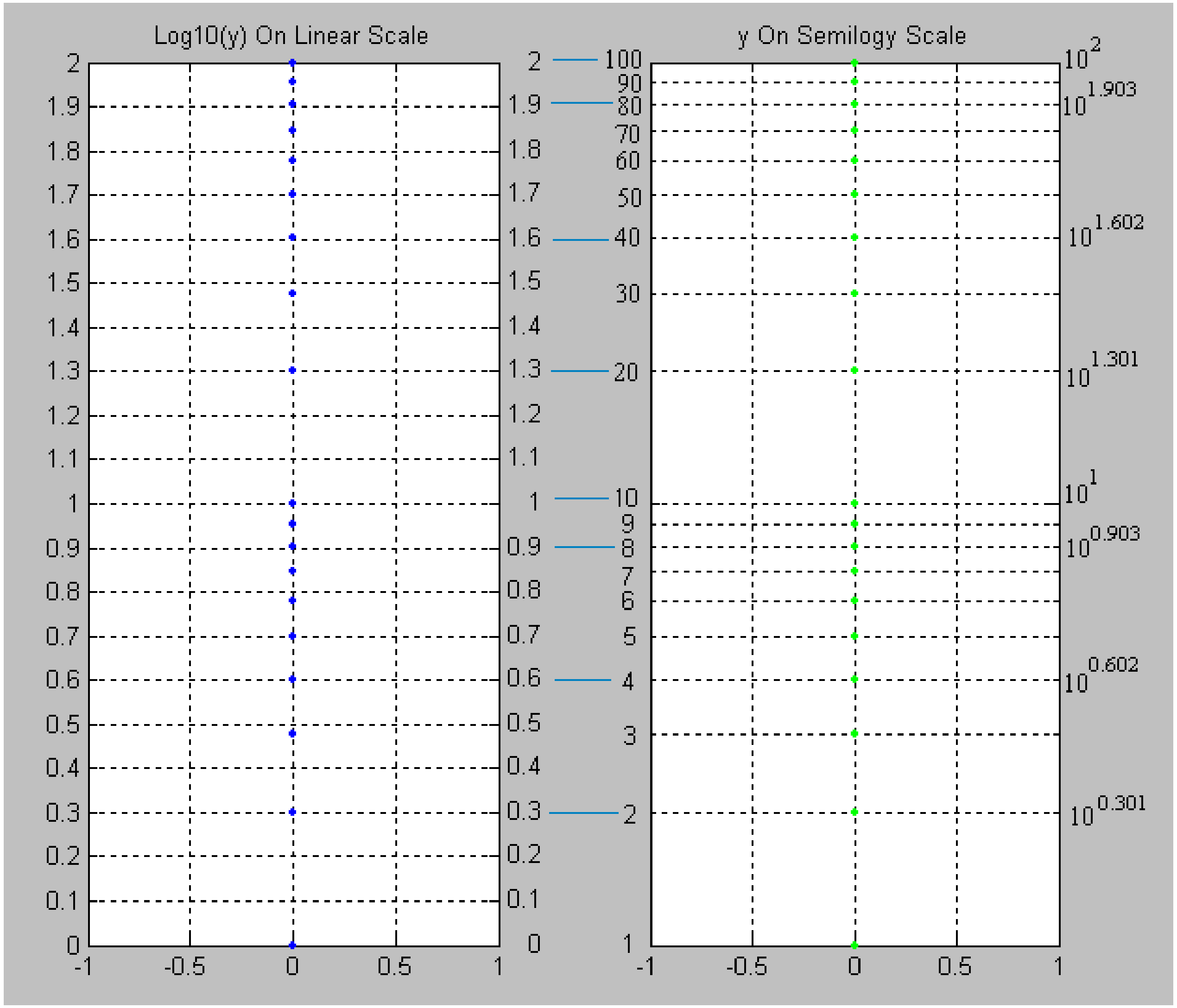
** A picture from Wikipedia*

Semi-logarithmic Scale Plot Example (3)

Log values

-
- *Log(1) = 0.00*
- *Log(2) = 0.31*
- *Log(3) = 0.47*
- *Log(4) = 0.60*
- *Log(5) = 0.70*
- *Log(6) = 0.78*
- *Log(7) = 0.85*
- *Log(8) = 0.90*
- *Log(9) = 0.95*
- *Log(10) = 1.0*

- *Log(20) = 1.31*
- *Log(30) = 1.47*
- *Log(40) = 1.60*
- *Log(50) = 1.70*
- *Log(60) = 1.78*
- *Log(70) = 1.85*
- *Log(80) = 1.90*
- *Log(90) = 1.95*
- *Log(100) = 2.0*



$\log(10^{1.903}) = 1.903$

$\log(10^{1.602}) = 1.602$

$\log(10^{1.301}) = 1.301$

$\log(10^{1}) = 1.0$

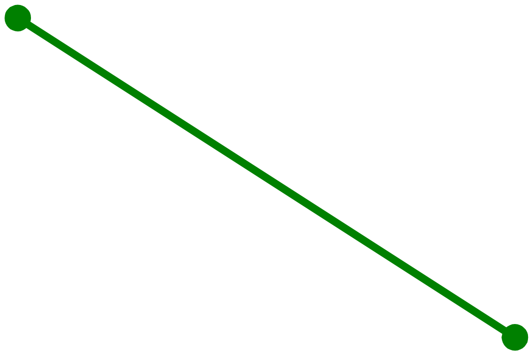
$\log(10^{0.903}) = 0.903$

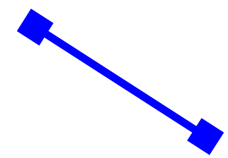
$\log(10^{0.602}) = 0.602$

$\log(10^{0.301}) = 0.301$

** A picture from Wikipedia*

Slope in a Logarithmic Plot (1)





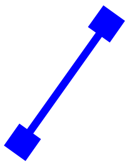
$$slope \quad m = \frac{(y_2 - y_1)}{(x_2 - x_1)}$$

$$slope = \frac{(\log(y_2) - \log(y_1))}{(\log(x_2) - \log(x_1))}$$

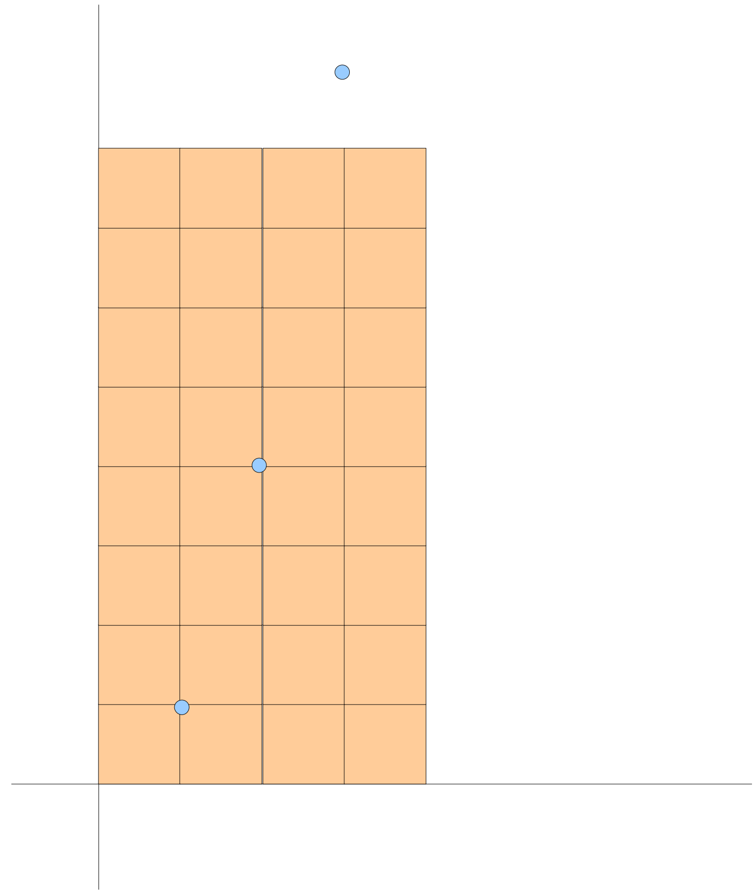
$$= \frac{\log(y_2/y_1)}{\log(x_2/x_1)}$$

Slope in a Logarithmic Plot (2)

$(\log(x_2),\ \log(y_2))$



$g(x_1),\ \log(y_1))$



$$\frac{\log(y_2/y_1)}{\log(x_2/x_1)} = 2$$

$$\log(y_2/y_1) = \log(x_2/x_1)^2$$

$$\left(\frac{y_2}{y_1}\right) = \left(\frac{x_2}{x_1}\right)^2$$

Young Won Lim
10/15/09

Photometric and Radiometric Units

Photometric Unit

- **Human eye's visual system**
- **More sensitive to some wavelengths than others**
- **Lux = lumen / meter^2**

Radiometric Unit

- **Based on physical power**
- **All wavelengths are weighted equally**
- **Watt / meter^2**

References

[1] http://en.wikipedia.org/