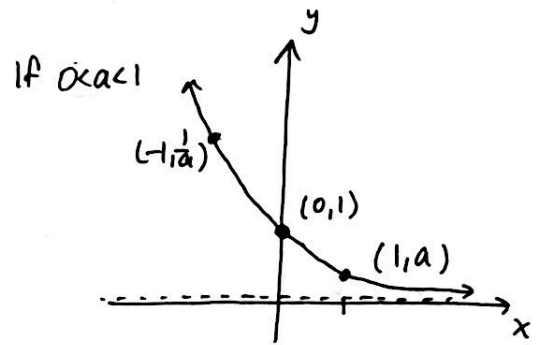
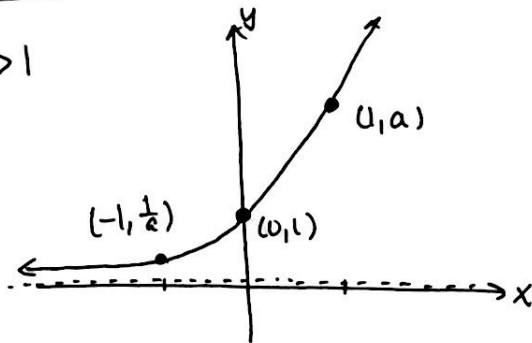


11/20/18

Exponential Functions

$f(x) = a^x \quad (a \neq 1)$

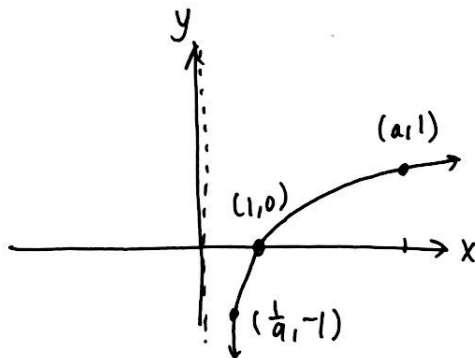
If $a > 1$



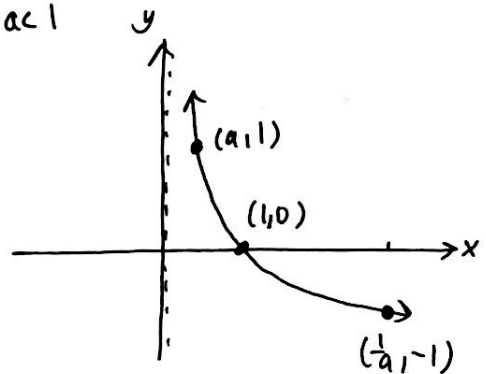
Logarithmic Functions

$f(x) = \log_a x$ ← these are the inverse functions of exp functions

If $a > 1$



If $0 < a < 1$



Switching between log and exp functions:

$y = a^x \iff x = \log_a y$

Ex Solve for t:
 $3(1.04)^{3t} = 8$

isolate exp term:

$(1.04)^{3t} = \frac{8}{3}$

rewrite as log:

$3t = \log_{1.04} \left(\frac{8}{3}\right)$

Solve for t:

$t = \frac{\log_{1.04} \left(\frac{8}{3}\right)}{3}$

Other properties:

$\log_a(a^x) = x$
 $a^{\log_a(x)} = x$

$\log_e = \ln$

$\log_{10} = \log$

these are on your calculator!

Ex Evaluate:

(a) $\log 1000 = \log_{10} 10^3 = 3$

(b) $\ln \sqrt[3]{e} = \ln e^{1/3} = \frac{1}{3}$

(c) $\log 0.1 = \log_{10} \frac{1}{10} = \log_{10} 10^{-1} = -1$

(d) $e^{\ln \pi} = \pi$

(e) $2^{\log_2 27} = 27$

More log properties:

$$\log_a A + \log_a B = \log_a (AB)$$

$$\log_a A - \log_a B = \log_a \left(\frac{A}{B}\right)$$

$$\log_a A^B = B \log_a A$$

Ex Write as one logarithm:

$$2 \log X + \frac{1}{3} \log (y) - \log z$$

$$\log x^2 + \log y^{1/3} - \log z$$

$$\log (x^2 y^{1/3}) - \log z$$

$$\log \left(\frac{x^2 y^{1/3}}{z} \right) \checkmark$$

Worksheet on exponentials.

Hints: (2) $f(x) = ab^x$. Use the two points to solve for a and b

(4) $f(t) = a \left(1 + \frac{r}{n}\right)^{nt}$

$a =$ initial amt
 $r =$ rate
 $n =$ # times compounded per year

(5) $w(t) = ab^t$

$a =$ initial amount
 $b =$ you need to find this using the given points