

6.2 Cont'd

Ex: Algebra Review

$$a) \frac{\left(\frac{a}{b}\right)}{\left(\frac{c}{d}\right)} = \frac{a}{b} \times \frac{d}{c}$$

$$b) \frac{1}{\left(\frac{c}{d}\right)} = 1 \times \frac{d}{c} = \frac{d}{c}$$

$$c) \frac{1}{\left(\frac{1}{3}\right)} = \frac{3}{1}$$

Ex: Find $f^{-1}(x)$ for $f(x) = \frac{3x+1}{x-1}$

$$f: \boxed{y = \frac{3x+1}{x-1}}$$

f^{-1} : Swap x and y

$$f^{-1}: x = \frac{3y+1}{y-1} \quad \text{Solve for } y$$

$$x(y-1) = 3y+1$$

$$xy - x = 3y + 1$$

$$xy - 3y = x + 1$$

$$y(x-3) = x+1$$

$$\boxed{y = \frac{x+1}{x-3}} \quad \checkmark$$

$$\boxed{f^{-1}(x) = \frac{x+1}{x-3}} \quad \checkmark$$

6.3 Exponential Functions

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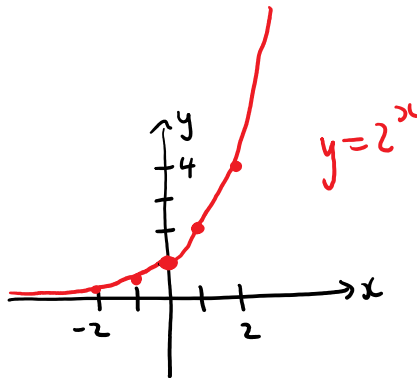
$$f(x) = a^x \quad a: \text{positive } \# \quad (a \neq 1)$$

e.g. $y = 2^x$ or $y = \left(\frac{1}{3}\right)^x$ etc.

Very different from $y = x^2$!

Ex: Graph $y = 2^x$

x	$y = 2^x$
-2	$2^{-2} = \frac{1}{2^2} = \frac{1}{4}$
-1	$2^{-1} = \frac{1}{2}$
0	$2^0 = 1$
1	$2^1 = 2$
2	$2^2 = 4$

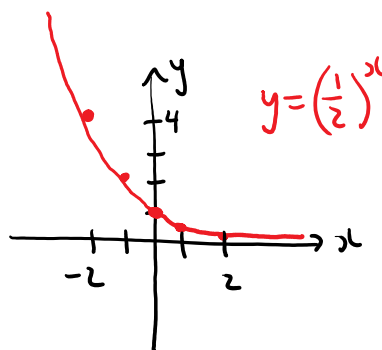


H.A. $y = 0$ as $x \rightarrow -\infty$

Ex: Graph $y = \left(\frac{1}{2}\right)^x$

x	$y = \left(\frac{1}{2}\right)^x$
-2	$\left(\frac{1}{2}\right)^{-2} = 2^2 = 4$
-1	$\left(\frac{1}{2}\right)^{-1} = 2$
0	$\left(\frac{1}{2}\right)^0 = 1$
1	$\left(\frac{1}{2}\right)^1 = \frac{1}{2}$
2	$\left(\frac{1}{2}\right)^2 = \frac{1}{4}$

$$\left(\frac{3}{4}\right)^{-1} = \frac{4}{3}$$
$$\left(\frac{1}{2}\right)^{-1} = 2$$



H.A. $y=0$ as $x \rightarrow \infty$

Know the graph $y=2^x$

Exponent Rules (Review) ⚡

1) $a^m \cdot a^n = a^{m+n}$

2) $\frac{a^m}{a^n} = a^{m-n}$

3) $(a^m)^n = a^{mn}$

4) $(ab)^m = a^m b^m$

5) $a^0 = 1$

6) $a^{-m} = \frac{1}{a^m}$

Ex: Simplify:

a) $\frac{2^{x+3}}{2^x} = 2^3 = 8$ Rule #2

b) $7^{x+2} \cdot 7^{2x+1} = 7^{3x+3}$ Rule #1

c) $(4^x)^3 = 4^{3x}$ Rule #3

The number e

$e \approx 2.72$

Important in engineering

On calculator:

$2^{nd} F$ e^x $|$ $=$

Ex: Calculate

— — —

a) $e^2 \approx 7.39$ $\boxed{2^{nd}} \boxed{F} \boxed{e^x} \boxed{2} \boxed{=}$

b) $e^{-3} \approx 0.05$ $\boxed{2^{nd}} \boxed{F} \boxed{e^x} \boxed{+/-} \boxed{3} \boxed{=}$

Definition of e (don't memorize)

As $x \rightarrow \infty$, $(1 + \frac{1}{x})^x \rightarrow e$

Ex: $x = 10,000$
 $(1 + \frac{1}{10,000})^{10,000} \approx 2.72$

Ex: Graph $y = e^x$

x	y
-1	$e^{-1} \approx 0.37$
0	$e^0 = 1$
1	$e^1 \approx 2.72$

