Date: 8/24/18

Chp: Chp. 1:3 → Exponential Functions

Obj: Remember....

- Graph exp. functions
- Find D & R of exp. func.
- Apply exp. func.
- The # e
- Apply e
- Exp. Growth & Decay

* Exponential Function=

Let (a) be a (+) real # other than 1.

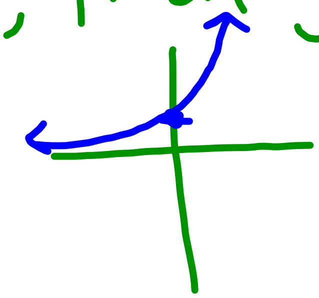
$$y=a^x \text{ or } f(x)=a^x$$

$D=(-\infty,\infty)$

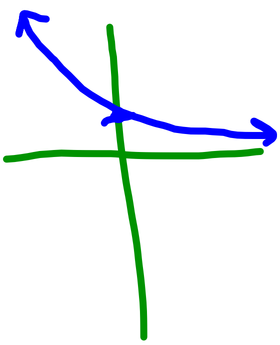
$R=(0,\infty)$

$$y=a^x$$

- If $a>1$, then graph looks like:



- If $0<a<1$, then graph looks like:

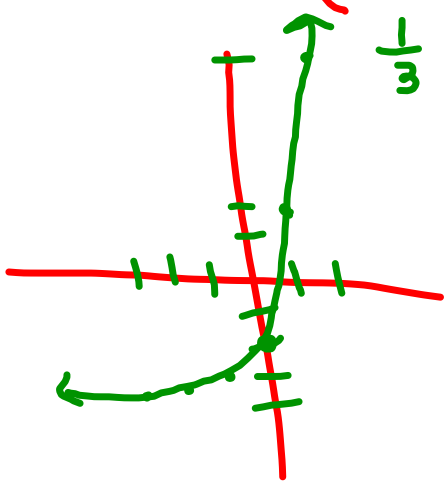


Ex. 1 - Graph then the D & R.

$$f(x) = 2(3^x) - 4$$

$\frac{2}{1} \cdot \frac{1}{3} = \frac{2}{3}$

$\frac{1}{3}$ $\frac{1}{3^2} = \frac{1}{9}$



x	y
0	-2
1	2
2	14
-1	-3.33
-2	-3.78
-3	-3.92

$D = (-\infty, \infty)$

$R = (-4, \infty)$

Ex. 2 - Find the zeros graphically.

$f(x) = 5 - 2.5^x$

$x = 1.756$

$y = 0$

Exponent Rules

If $a > 0$ & $b > 0$, the following hold for all $\mathbb{R}$ x & y:

1) $a^{-x} = \frac{1}{a^x}$ or $\frac{1}{a^{-x}} = a^x$

2) $a^x \cdot a^y = a^{x+y}$

3) $\frac{a^x}{a^y}$ = subtract the exp. & put where bigger exp. is

4) $(a^x)^y = a^{xy}$

5) $(a \cdot b)^x = a^x \cdot b^x$

6) $\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$

7) $a^0 = 1$

Exponential Growth

$$y = a(1+r)^t \rightarrow \text{time}$$

a: orig. amount

r: rate as dec.

$$y = 2(1.37)^t$$

Exponential Decay

$$y = a(1-r)^t$$

$$y = 2(0.86)^t$$

Half-Life = the amount of time it takes for half of a radioactive substance to turn into its nonradioactive form.

$$y = a\left(\frac{1}{2}\right)^{x/t}$$

Ex. 3

Suppose the half-life of a certain radioactive material is 20 days & there are 5 g present initially. When will there only be 1 g of substance remaining?

$$y = a\left(\frac{1}{2}\right)^{x/t}$$

$$1 = 5\left(\frac{1}{2}\right)^{x/20}$$

$$\frac{1}{5} = \frac{1}{2}^{x/20}$$

$$\frac{\log\frac{1}{5}}{\log\frac{1}{2}} = \frac{\frac{x}{20}\cancel{\log\frac{1}{2}}}{\cancel{\log\frac{1}{2}}}$$

$$2.32 = \frac{x}{20}$$

46.4 days $= x$

The # e

2.718281828....

It is defined as the # that the function $f(x) = \left(1+\frac{1}{x}\right)^x$ approaches as x approaches ∞.

Compound Continuously

$y = Pe^{rt}$ → time in yrs.

P ↓ initial amount

r ↓ rate as dec

Compound Interest

$y = P\left(1 + \frac{r}{t}\right)^{nt}$

n ↓ # of times compounded

Ex. 7

$P = \$500$

$r = 4.75\%$

$n = 5$ yrs

annually $= 1$ yr

$$y = P\left(1 + \frac{r}{t}\right)^{nt}$$

p.27 (#21, 23, 24, 36, 40)