10/13

Friday, October 13, 2017 9:06 AM

Exam 2:

- 4 multiple choice questions
- 4 open ended questions
- sections: 3.3 – 3.6

Reviews:

- Saturday, 10/14, 10AM-noon, MMC PCA 135
- Sunday 8-9PM, online

Review:

Solve: $x^3+9x^2+16x=6$

$-6 \quad -6$

$x^3+9x^2+16x-6=0$

$-6: \pm1, \pm2, \pm3, \pm6$

$1: \pm1$

} $\pm1, \pm2, \pm3, \pm6$

Descartes's rule:

$f(x)=x^3+9x^2+16x-6$ 1 change → 1 pos. root

$f(-x)=-x^3+9x^2-16x-6$ 2 changes → 2 or 0 neg. roots

$f(x) = x^3 + 7x^2 + 10x - 6$ 2 changes → 2 or 0 neg. roots

	1	9	16	−6
−3	↓	−3	−18	6
	1	6	−2	0

$x = -3$ is a solution

$$x^2 + 6x - 2 = 0$$

$$x = \frac{-6 \pm \sqrt{6^2 - 4(1)(-2)}}{2 \cdot 1} = \frac{-6 \pm \sqrt{36+8}}{2}$$

$$= \frac{-6 \pm \sqrt{44}}{2} = \frac{-6 \pm 2\cdot\sqrt{11}}{2} = \frac{-6}{2} \pm \frac{2\sqrt{11}}{2}$$

$$= \boxed{-3 \pm \sqrt{11}} \quad (\sqrt{11} \approx 3.3)$$

$\boxed{-3+\sqrt{11}} \approx -3+3.3 = 0.3$

$\boxed{-3-\sqrt{11}} \approx -3-3.3 = -6.3$

Section 4.1 (Exponential functions)

Def: The exponential function f with base b is defined as

$$f(x) = b^x \quad \text{or} \quad y = b^x,$$

where b is a positive constant other than 1 and x can be any real number

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

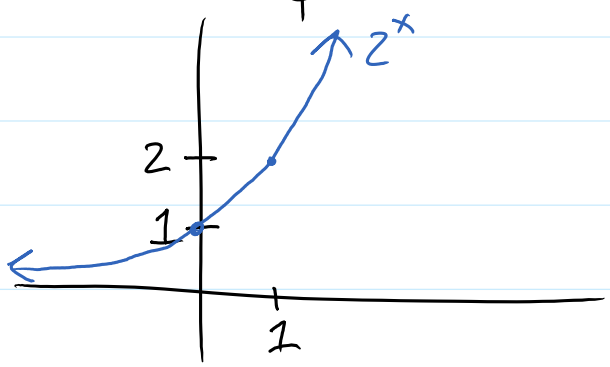
Ex: $y = 2^x$ or $f(x) = 2^x$

let's graph it

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

$x^0 = 1$ (even if $x=0$)

x	-10	-2	-1	0	1	2	4
$f(x)$	2^{-10}	2^{-2}	$\frac{1}{2}$	2^0	2	4	16
	$=$	$=$		$=$			
	$\frac{1}{2^{10}}$	$\frac{1}{2^2}$		1			
		$=$					
		$\frac{1}{4}$					



Dom: $(-\infty, \infty)$

Range: $(0, \infty)$

horizontal asym: $y = 0$

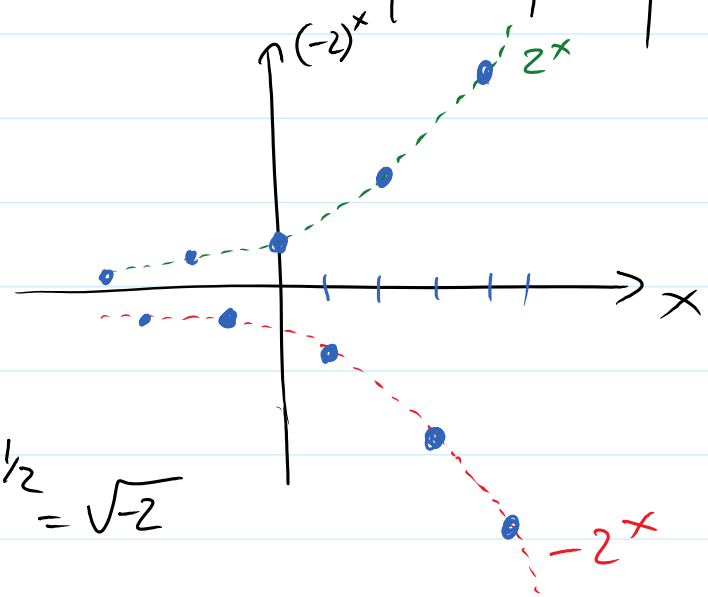
What if $b = 1$ or is negative?

$f(x) = 1^x = 1$ ← constant function, not an exponential.

x	-2	-1	0	1	2
$f(x)$	$1^{-2} = \frac{1}{1^2} = 1$	1	$1^0 = 1$	1	1

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

x	0	1	2	3	4	5
$f(x)$	1	-2	4	-8	16	-32



$f\left(\frac{1}{2}\right) = (-2)^{1/2} = \sqrt{-2}$

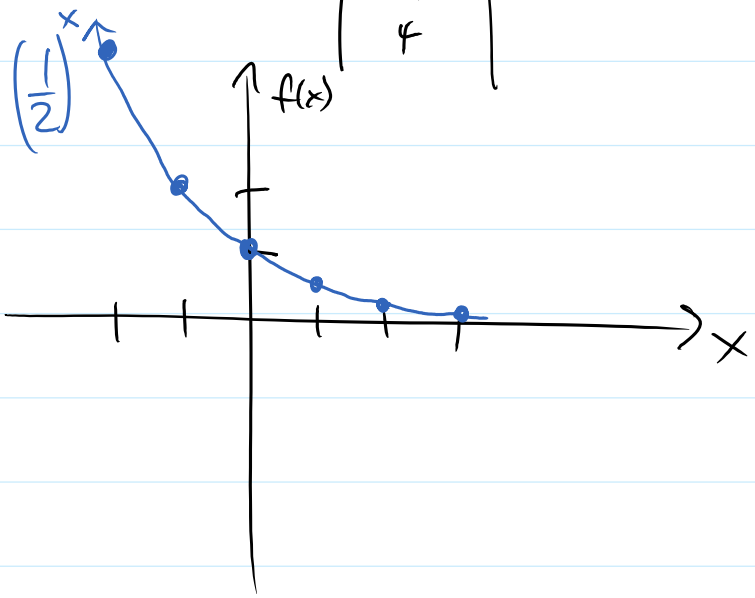
Ex: Graph $f(x) = \left(\frac{1}{2}\right)^x$

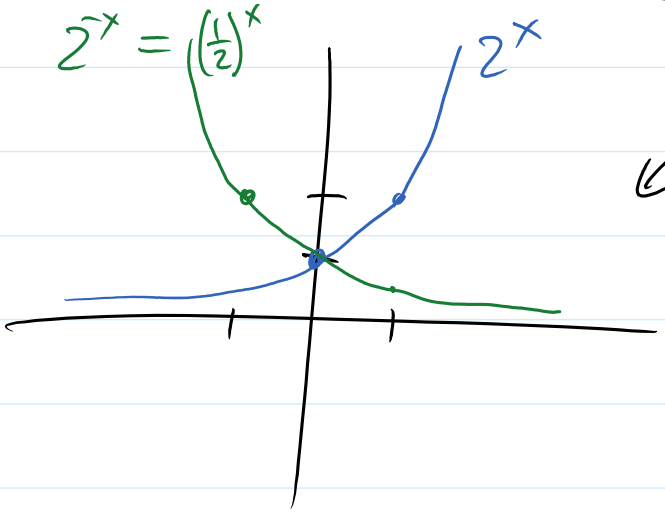
Alg. rules

$$\left(\frac{a}{b}\right)^{-c} = \left(\frac{b}{a}\right)^{c}$$

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

x	-2	-1	0	1	2	3
$f(x)$	$\left(\frac{1}{2}\right)^{-2}$	$\left(\frac{1}{2}\right)^{-1}$	1	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$
	$\left(\frac{2}{1}\right)^{2}$	$\left(\frac{2}{1}\right)^{1}$				
	2^2	2				
	4					





what's the relationship?

Simplify: $\left(\frac{1}{2}\right)^x = \frac{1^x}{2^x} = \frac{1}{2^x} = 2^{-x}$

$f(x) = 2^x$, what transformation gives:

$f(-x) = 2^{-x}$

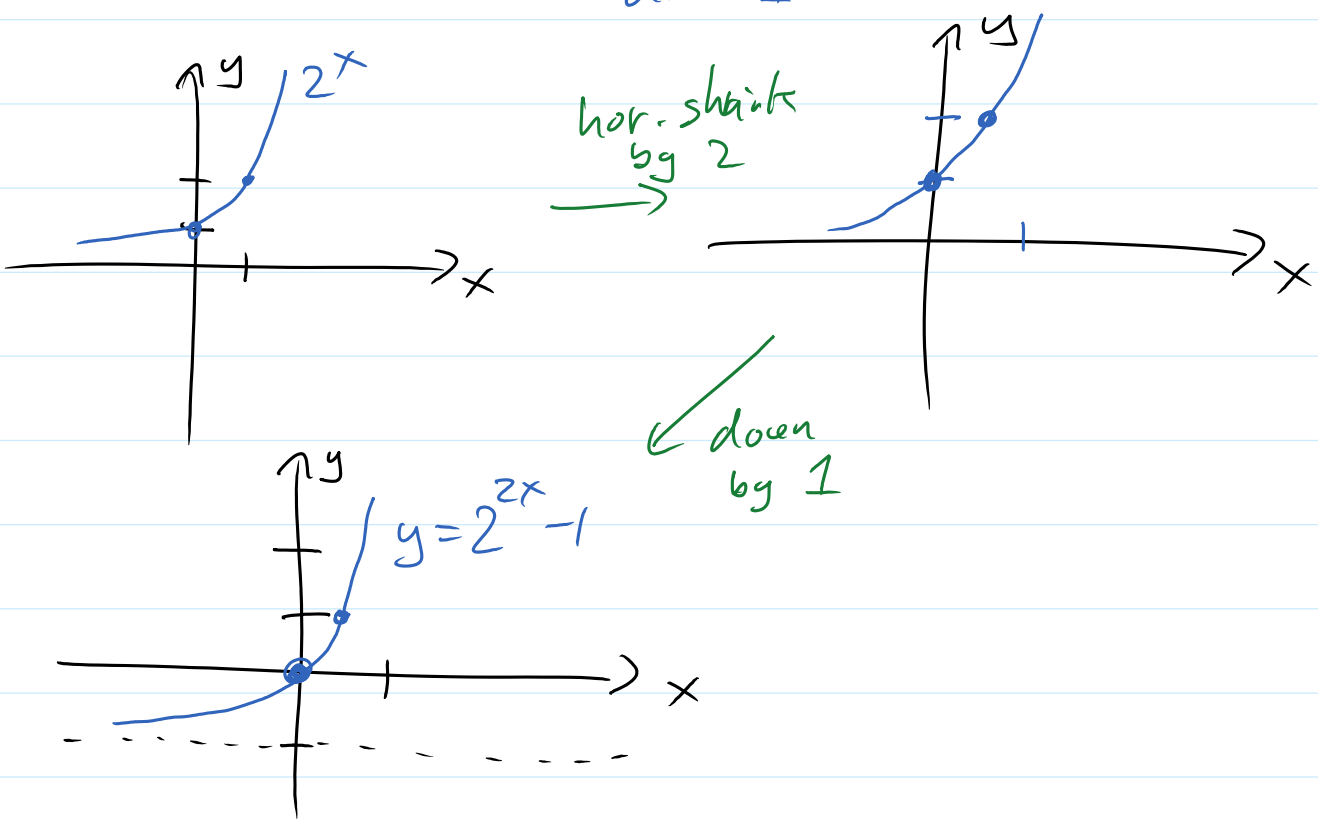
↖ reflection about the y-axis

Ex: Use the transf. to graph

$f(x) = 2^{2x} - 1$

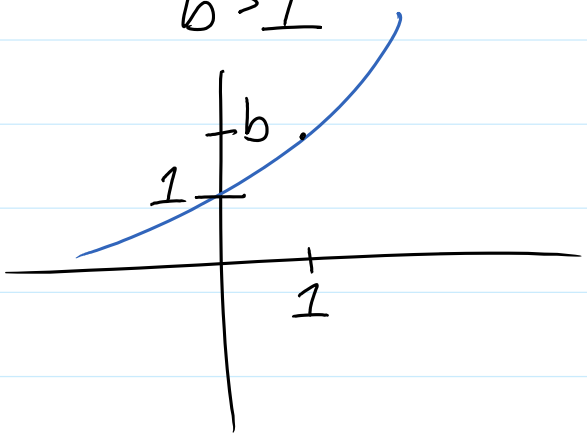
$2x$: ← hor. shrink

-1: down 1

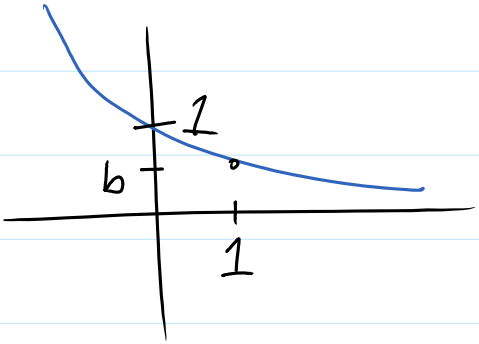


The graph of $y = b^x$ is

$b > 1$

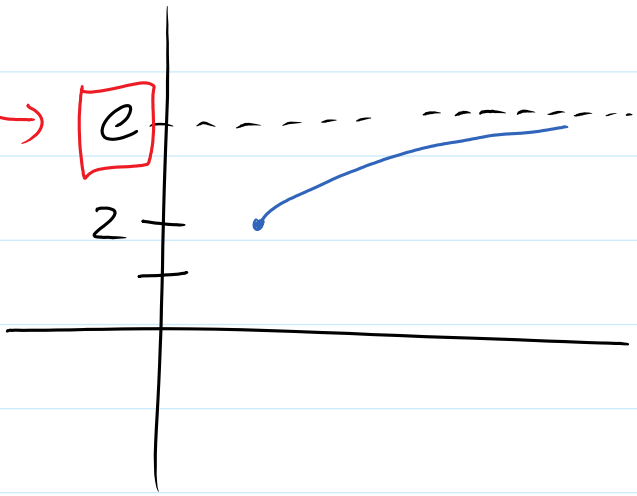


$0 < b < 1$



Euler constant

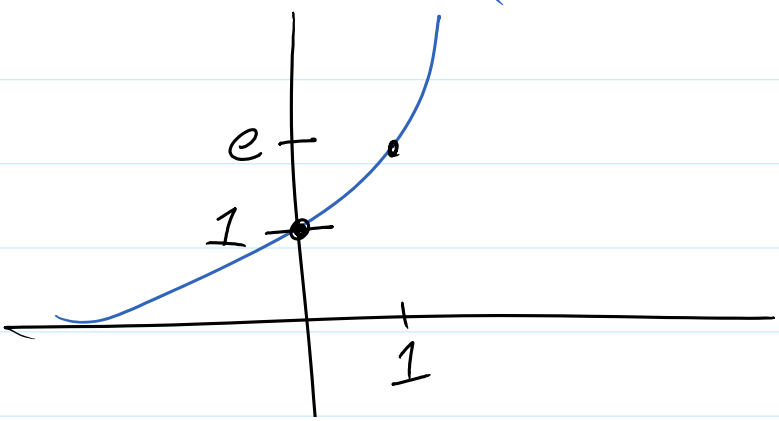
$$f(n) = \left(1 + \frac{1}{n}\right)^n$$

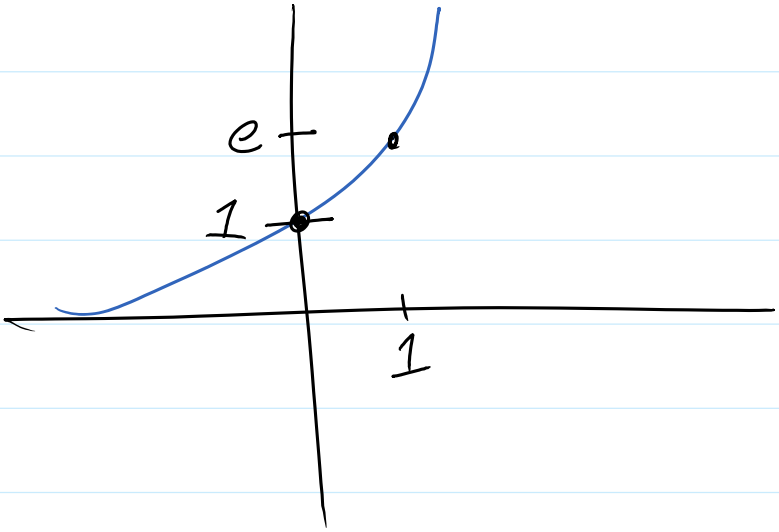


$e \approx 2.718\ldots$

Plot $f(x) = e^x$ (natural exponential func.)

(e is natural base)

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1