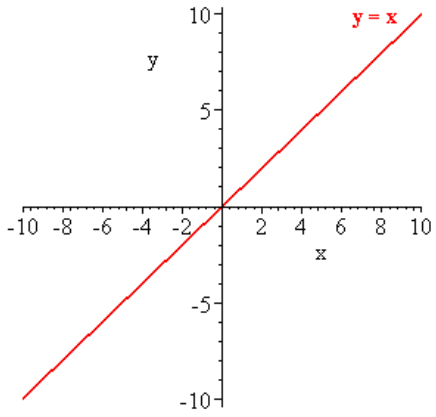
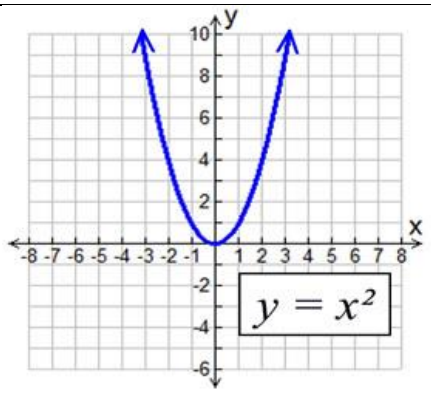
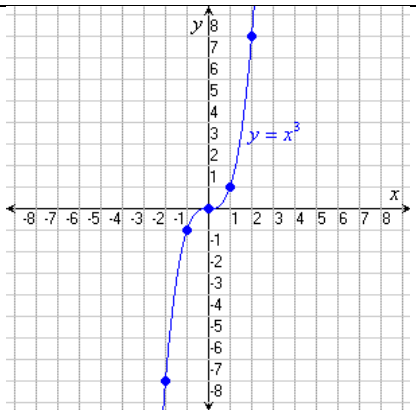
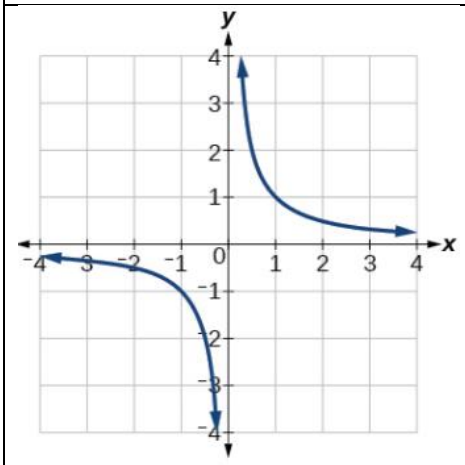
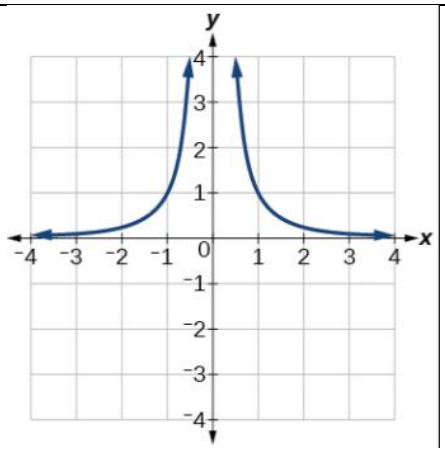
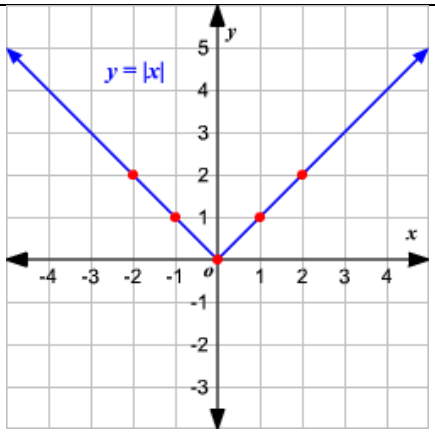
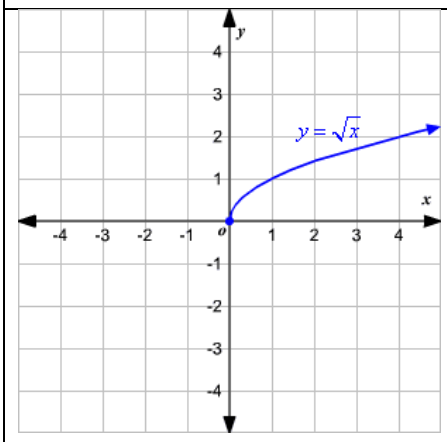
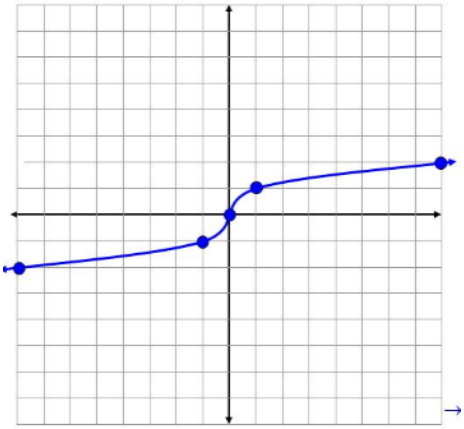
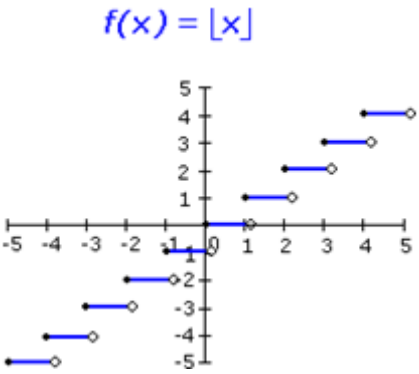
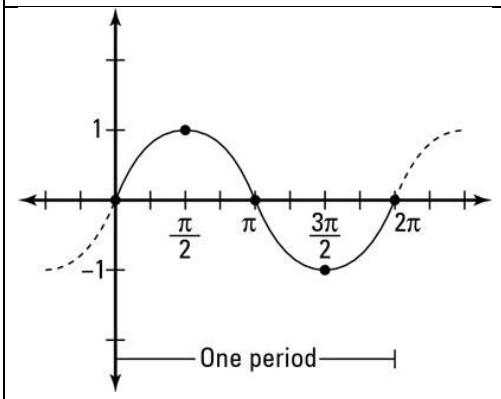
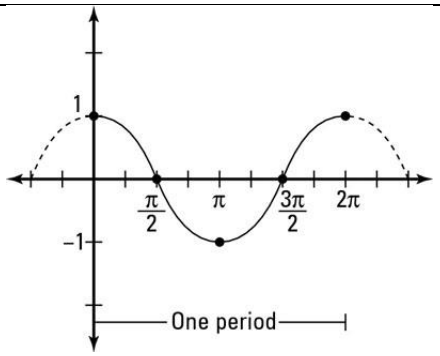
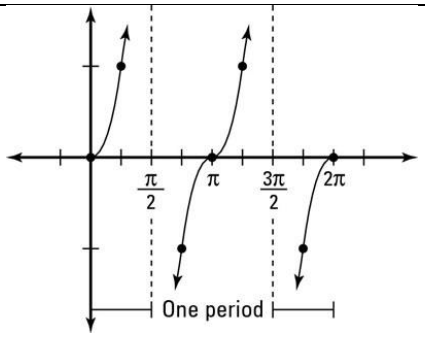
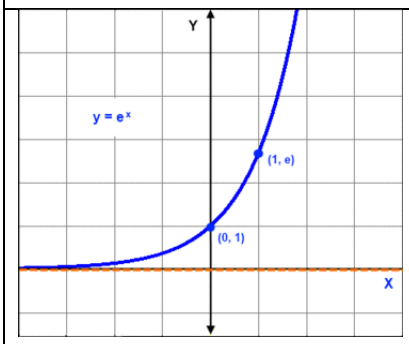
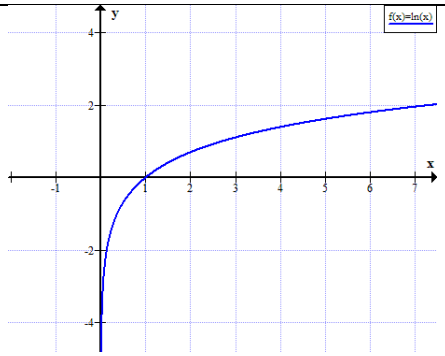
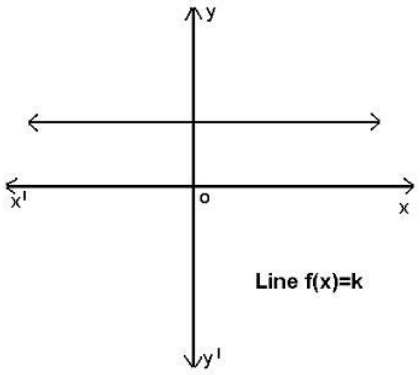
Pre-Calculus –Library of Mother Functions Notes

The Identity Function	The Squaring Function	The Cubic Function "Snakes"
		
Function Rule $f(x) = x$	Function Rule $f(x) = x^2$	Function Rule $f(x) = x^3$
Domain $(-\infty, \infty)$	Domain $(-\infty, \infty)$	Domain $(-\infty, \infty)$
Range $(-\infty, \infty)$	Range $[0, \infty)$	Range $(-\infty, \infty)$
Continuous YES/NO Type of Discontinuity N/A	Continuous YES/NO Type of Discontinuity N/A	Continuous YES/NO Type of Discontinuity N/A
Increasing $(-\infty, \infty)$	Increasing $(0, \infty)$	Increasing $(-\infty, \infty)$
Decreasing none	Decreasing $(-\infty, 0)$	Decreasing none
Constant none	Constant none	Constant none
Bounded/Unbounded Bounded Above/Bounded Below	Bounded/Unbounded Bounded Above/Bounded Below	Bounded/Unbounded Bounded Above/Bounded Below
Local Mins none Local Maxs none Absolute Min none Absolute Max none	Local Mins $(0,0)$ Local Maxs none Absolute Min $(0,0)$ Absolute Max none	Local Mins none Local Maxs none Absolute Min none Absolute Max none
Even/Odd/Neither	Even/Odd/Neither	Even/Odd/Neither
Vertical Asymptotes none Horizontal Asymptotes none	Vertical Asymptotes none Horizontal Asymptotes none	Vertical Asymptotes none Horizontal Asymptotes none

The Reciprocal Function	The "Volcano" Function	The Absolute Value Function
		
Function Rule $f(x) = \frac{1}{x}$	Function Rule $f(x) = \frac{1}{x^2}$	Function Rule $f(x) = \|x\|$
Domain $(-\infty, 0)\cup(0, \infty)$	Domain $(-\infty, 0)\cup(0, \infty)$	Domain $(-\infty, \infty)$
Range $(-\infty, 0)\cup(0, \infty)$	Range $(0, \infty)$	Range $[0, \infty)$
Continuous YES/NO Type of Discontinuity infininite	Continuous YES/NO Type of Discontinuity infinite	Continuous YES/NO Type of Discontinuity N/A
Increasing none	Increasing $(-\infty, 0)$	Increasing $(0, \infty)$
Decreasing $(-\infty, 0)\cup(0, \infty)$	Decreasing $(0, \infty)$	Decreasing $(-\infty, 0)$
Constant none	Constant none	Constant none
Bounded/Unbounded Bounded Above/Bounded Below	Bounded/Unbounded Bounded Above/Bounded Below	Bounded/Unbounded Bounded Above/Bounded Below
Local Mins none Local Maxs none Absolute Min none Absolute Max none	Local Mins none Local Maxs none Absolute Min none Absolute Max none	Local Mins $(0,0)$ Local Maxs none Absolute Min $(0,0)$ Absolute Max none
Even/Odd/Neither	Even/Odd/Neither	Even/Odd/Neither
Vertical Asymptotes $x = 0$ Horizontal Asymptotes $y = 0$	Vertical Asymptotes $x = 0$ Horizontal Asymptotes $y = 0$	Vertical Asymptotes none Horizontal Asymptotes none

The Square Root Function *Bottom evens!	The Cube Root Function *Bottom odds=lazy snakes!	The Greatest Integer Function *Step Function!
		
Function Rule $f(x)=\sqrt{x}$ Domain $[0,\infty)$ Range $[0,\infty)$ Continuous YES/NO Type of Discontinuity N/A Increasing $(0,\infty)$ Decreasing none Constant none Bounded/Unbounded Bounded Above/Bounded Below Local Mins $(0,0)$ Local Maxs none Absolute Min $(0,0)$ Absolute Max none Even/Odd/Neither Vertical Asymptotes none Horizontal Asymptotes none	Function Rule $f(x)=\sqrt[3]{x}$ Domain $(-\infty,\infty)$ Range $(-\infty,\infty)$ Continuous YES/NO Type of Discontinuity N/A Increasing $(-\infty,\infty)$ Decreasing none Constant none Bounded/Unbounded Bounded Above/Bounded Below Local Mins none Local Maxs none Absolute Min none Absolute Max none Even/Odd/Neither Vertical Asymptotes none Horizontal Asymptotes none	Function Rule $f(x)=[\![x]\!]$ Domain $(-\infty,\infty)$ Range $y=k, k$ is an integer Continuous YES/NO Type of Discontinuity jump Increasing none Decreasing none Constant … $(-5,4)U(-4,-3)U(-3,-2)$ … Bounded/Unbounded Bounded Above/Bounded Below Local Mins none Local Maxs none Absolute Min none Absolute Max none Even/Odd/Neither Vertical Asymptotes none Horizontal Asymptotes none

The Sine Function	The Cosine Function	The Tangent Function
		
Function Rule___$f(x) = \sin x$_____	Function Rule___$f(x) = \cos x$_____	Function Rule__$f(x) = \tan x$_____
Domain _____$(-\infty, \infty)$_____	Domain _____$(-\infty, \infty)$_____	Domain _$x \neq \cdots -\frac{\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}, \ldots$
Range _____$[-1,1]$_____	Range _____$[-1,1]$_____	Range _____$(-\infty, \infty)$_____
Continuous <u>YES</u>/NO Type of Discontinuity _____	Continuous <u>YES</u>/NO Type of Discontinuity _____	Continuous YES/<u>NO</u> Type of Discontinuity <u>infinite</u>
Increasing on $(0,2\pi)$:_$(0,\frac{\pi}{2})$U$(\frac{3\pi}{2}, 2\pi)$_	Increasing on $(0,2\pi)$: __$(\pi, 2\pi)$__	Increasing _<u>over one period $(-\frac{\pi}{2}, \frac{\pi}{2})$</u>
Decreasing on $(0,2\pi)$: __$(\frac{\pi}{2}, \frac{3\pi}{2})$_____	Decreasing on $(0,2\pi)$: __$(0, \pi)$____	Decreasing __<u>none</u>_____
Constant_____none_____	Constant____none_____	Constant_____<u>none</u>_____
<u>Bounded</u>/Unbounded Bounded Above/Bounded Below	<u>Bounded</u>/Unbounded Bounded Above/Bounded Below	Bounded/<u>Unbounded</u> Bounded Above/Bounded Below
Local Mins_____-1_____ Local Maxs_____1_____ Absolute Min_____-1_____ Absolute Max_____1_____	Local Mins_____-1_____ Local Maxs_____1_____ Absolute Min_____-1_____ Absolute Max_____1_____	Local Mins_____<u>none</u>_____ Local Maxs_____<u>none</u>_____ Absolute Min_____<u>none</u>_____ Absolute Max_____<u>none</u>_____
Even/<u>Odd</u>/Neither	<u>Even</u>/Odd/Neither	Even/<u>Odd</u>/Neither
Vertical Asymptotes__none_____ Horizontal Asymptotes__none_____	Vertical Asymptotes__none_____ Horizontal Asymptotes__none_____	Vertical Asymptotes_$x = \cdots -\frac{\pi}{2}, \frac{\pi}{2}, \frac{3\pi}{2}, \ldots$ Horizontal Asymptotes__none_____

The Exponential Function **Euler's Number and y=e^x	The Natural Log Function	The Constant Function
		
Function Rule_____$f(x) = e^x$_____ Domain ___$(-\infty, \infty)$_____ Range _____$(0, \infty)$_____ Continuous YES/NO Type of Discontinuity _____ Increasing _____$(-\infty, \infty)$_____ Decreasing _____none_____ Constant_____none_____ Bounded/Unbounded Bounded Above/Bounded Below Local Mins_____none_____ Local Maxs_____none_____ Absolute Min_____none_____ Absolute Max_____none_____ Even/Odd/Neither Vertical Asymptotes ___none_____ Horizontal Asymptotes ___$y = 0$___	Function Rule__ $f(x) = \ln x$_____ Domain _____$(0, \infty)$_____ Range _____$(-\infty, \infty)$___ Continuous YES/NO Type of Discontinuity _____ Increasing _____$(-\infty, \infty)$_____ Decreasing _____none_____ Constant_____none_____ Bounded/Unbounded Bounded Above/Bounded Below Local Mins_____none_____ Local Maxs_____none_____ Absolute Min_____none_____ Absolute Max_____none_____ Even/Odd/Neither Vertical Asymptotes ___$x = 0$ Horizontal Asymptotes _none_____	Function Rule__ $f(x) = k$, k is an integer Domain _____$(-\infty, \infty)$_____ Range _____$y = k$_____ Continuous YES/NO Type of Discontinuity _____ Increasing ____none_____ Decreasing _____none_____ Constant_____$(-\infty, \infty)$___ Bounded/Unbounded Bounded Above/Bounded Below Local Mins_____0_____ Local Maxs_____0_____ Absolute Min_____0_____ Absolute Max_____0_____ Even/Odd/Neither Vertical Asymptotes ___none_____ Horizontal Asymptotes __none____