Math 002 Trigonometric Functions

Let $b > 0,\ a, c, d \in \Re$ **and** n **be any integer**

Function : y =	Amp.	Domain	Range	Period	Ph. Shift	V. Tran.
$a \sin\ b(x-c)+d$	$\|a\|$	$\Re$	$\Big[-\|a\|+d, \|a\|+d\Big]$	$\frac{2\pi}{b}$	$\|c\|$ units to right if $c > 0$, to left if $c < 0$	$\|d\|$ units up if $d > 0$, down if $d < 0$
$a \cos\ b(x-c)+d$	$\|a\|$	$\Re$	$\Big[-\|a\|+d, \|a\|+d\Big]$	$\frac{2\pi}{b}$	$\|c\|$ units to right if $c > 0$, to left if $c < 0$	$\|d\|$ units up if $d > 0$, down if $d < 0$
$a \csc\ b(x-c)+d$	None	$\Re - \{\frac{n\pi}{b}+c\}$	$(-\infty, -\|a\|+d\Big] \cup \Big[\|a\|+d, \infty)$	$\frac{2\pi}{b}$	$\|c\|$ units to right if $c > 0$, to left if $c < 0$	$\|d\|$ units up if $d > 0$, down if $d < 0$
$a \sec\ b(x-c)+d$	None	$\Re - \{(2n+1)\frac{\pi}{2b}+c\}$	$(-\infty, -\|a\|+d\Big] \cup \Big[\|a\|+d, \infty)$	$\frac{2\pi}{b}$	$\|c\|$ units to right if $c > 0$, to left if $c < 0$	$\|d\|$ units up if $d > 0$, down if $d < 0$
$a \tan\ b(x-c)+d$	None	$\Re - \{(2n+1)\frac{\pi}{2b}+c\}$	$\Re$	$\frac{\pi}{b}$	$\|c\|$ units to right if $c > 0$, to left if $c < 0$	$\|d\|$ units up if $d > 0$, down if $d < 0$
$a \cot\ b(x-c)+d$	None	$\Re - \{\frac{n\pi}{b}+c\}$	$\Re$	$\frac{\pi}{b}$	$\|c\|$ units to right if $c > 0$, to left if $c < 0$	$\|d\|$ units up if $d > 0$, down if $d < 0$

- **The vertical asymptotes of :**
  1. $y = a \csc\ b(x-c)+d$ are $x = \frac{n\pi}{b}+c$
  2. $y = a \sec\ b(x-c)+d$ are $x = (2n+1)\frac{\pi}{2b}+c$
  3. $y = a \tan\ b(x-c)+d$ are $x = (2n+1)\frac{\pi}{2b}+c$
  4. $y = a \cot\ b(x-c)+d$ are $x = \frac{n\pi}{b}+c$

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