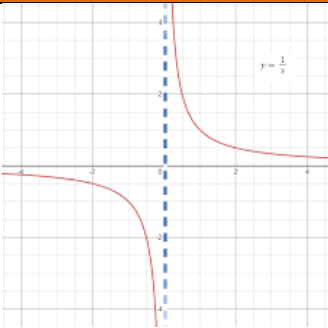
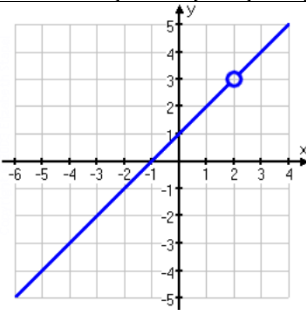
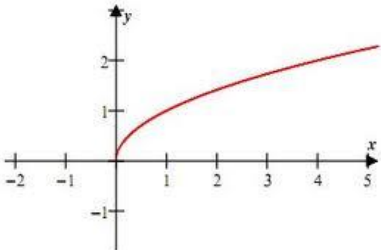
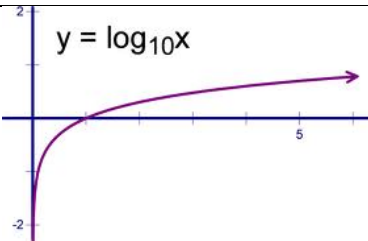


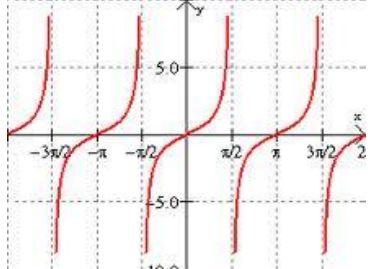
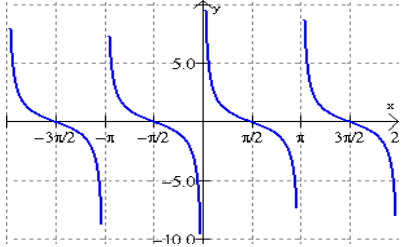
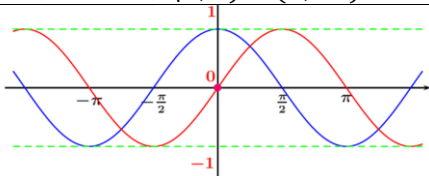
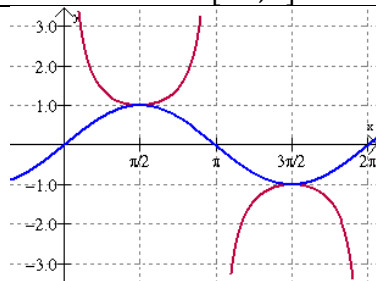
Harold's Illegals Cheat Sheet

18 August 2025

Algebra

Function	What is Undefined?	When is it Defined?	Graph
$\frac{1}{x}$	Division by zero (0) (vertical asymptote)	$x \neq 0$	 Domain: $(-\infty, 0) \cup (0, \infty)$
$f(x) \frac{(x - c)}{(x - c)}$	Division by zero (0) – special case (hole at $x = c$)	$x \neq c$	 Domain: $(-\infty, c) \cup (c, \infty)$
$\sqrt{x}$	Negative square roots	$x \geq 0$	 Domain: $[0, \infty)$
$\sqrt[n]{x} = x^{\frac{1}{n}}$	Negative even-powered roots	$x \geq 0$	Domain: $[0, \infty)$
$\log x$ $\ln x$	Negative logarithms	$x > 0$	 Domain: $(0, \infty)$

Trigonometry

Function	What is Undefined?	When is it Defined?	Graph
$\tan x$ $\sec x$	Trig functions with division by zero when $\cos x = 0$	$x \neq \frac{\pi}{2} \pm n\pi$	 Domain: $(-\frac{\pi}{2}, \frac{\pi}{2})$
$\cot x$ $\csc x$	Trig functions with division by zero when $\sin x = 0$	$x \neq \pm n\pi$	 Domain: $(0, \pi) \cup (\pi, 2\pi)$
$\sin^{-1} x$ $\cos^{-1} x$	Inverse trig functions where $ x > 1$	$ x \leq 1$	 Domain: $[-1, 1]$
$\sec^{-1} x$ $\csc^{-1} x$	Inverse trig functions where $ x < 1$	$ x \geq 1$	 Domain: $(-\infty, -1] \cup [1, \infty)$

Zero/Infinity

Number	What is Undefined?	When is it Defined?
Zero (0) Infinity (∞)	$\frac{0}{0}, \frac{\infty}{\infty}, 0 \cdot \infty, \infty - \infty, 0^0, \infty^0, 1^\infty, x^\infty$	$0^\infty \rightarrow 0, \quad \infty^\infty \rightarrow \infty$ $\frac{0}{\infty} \rightarrow 0, \quad \frac{\infty}{0} \rightarrow \infty$
Infinity (∞)	Treating infinity like a number. $f(\infty)$	$\lim_{x \rightarrow \infty} f(x)$
Proof $2 = 1$	Given: $a = b$ Proof: $a = b$ $a^2 = a \cdot b$ $a^2 - b^2 = a \cdot b - b^2$ $(a + b)(a - b) = b(a - b)$ $a + b = b$ $b + b = b$ $2b = b$ $2 = 1$	Can you find the illegal operation?

NOTE: Illegal = [Undefined expression](#) per Wikipedia