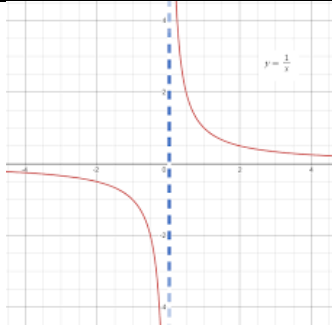
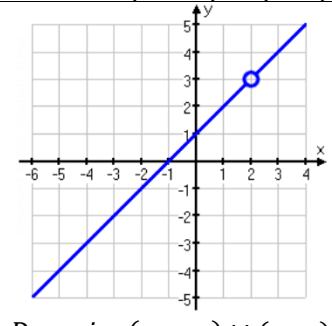
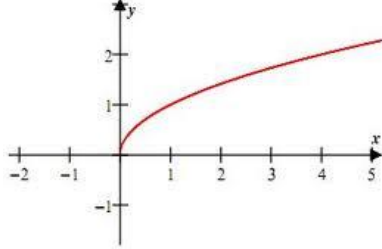
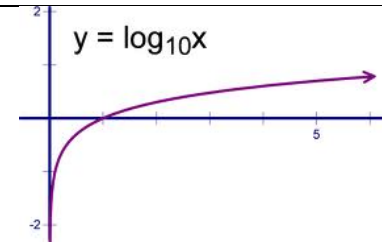


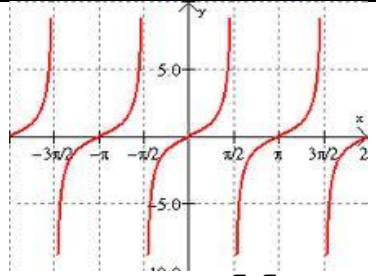
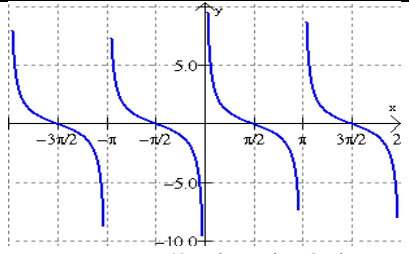
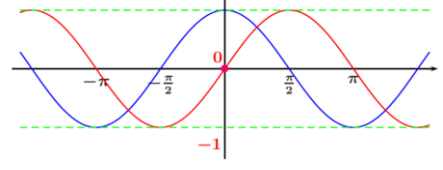
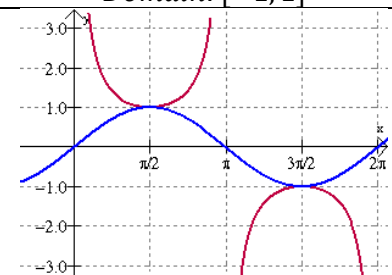
# Harold's Illegals Cheat Sheet

2 January 2026

## Algebra

Function	What is Undefined?	When is it Defined?	Graph
$\frac{1}{x}$	Division by zero (0) (vertical asymptote)	$x \neq 0$	 <p style="text-align: center;"><i>Domain: <math>(-\infty, 0) \cup (0, \infty)</math></i></p>
$f(x) \frac{(x - c)}{(x - c)}$	Division by zero (0) – special case (hole at $x = c$ )	$x \neq c$	 <p style="text-align: center;"><i>Domain: <math>(-\infty, c) \cup (c, \infty)</math></i></p>
$\sqrt{x}$	Negative square roots	$x \geq 0$	 <p style="text-align: center;"><i>Domain: <math>[0, \infty)</math></i></p>
$\sqrt[2n]{x} = x^{\frac{1}{2n}}$	Negative even-powered roots	$x \geq 0$	<p style="text-align: center;"><i>Domain: <math>[0, \infty)</math></i></p>
$\log x$ $\ln x$	Negative logarithms	$x > 0$	 <p style="text-align: center;"><i>Domain: <math>(0, \infty)</math></i></p>

# Trigonometry

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

## Zero/Infinity

Number	What is Undefined?	When is it Defined?
Zero (0) Infinity ( $\infty$ )	$\frac{0}{0}, \frac{\infty}{\infty}, 0 \cdot \infty, \infty - \infty, 0^0, \infty^0, 1^\infty, x^\infty$  Incorrect Math: <div style="background-color: #ffe4c4; padding: 10px; border: 1px solid #ccc;"> <ol style="list-style-type: none"> <li>1. <math>\frac{0}{0} = 1</math></li> <li>2. <math>\infty^0 = 1</math></li> <li>3. <math>\infty - \infty = \infty</math></li> <li>4. <math>1^\infty = 1</math></li> <li>5. <math>0^0 = 1</math></li> <li>6. <math>\frac{\infty}{\infty} = \infty</math></li> <li>7. <math>0 \cdot \infty = 0</math></li> </ol> </div>	Correct Math:  $0^\infty \rightarrow 0$  $\infty^\infty \rightarrow \infty$  $\frac{0}{\infty} \rightarrow 0$  $\frac{\infty}{0} \rightarrow \infty$
Infinity ( $\infty$ )	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