

Write your questions and thoughts here!

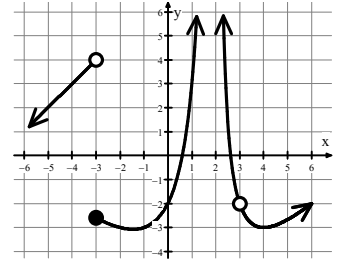
3.1 Discontinuity & Domain

Name: _____

An Algebraic Approach

Recall:

- Types of discontinuities:
 - Point (removable)
 - Infinite (vertical asymptote) (nonremovable)
 - Jump



- Domain refers to all the possible x-values of a function.

Discontinuities – (1) Find and (2) Classify each discontinuity.

- Set denom = 0
- If factor cancels, hole!
- If factor stays, VA

<p>1. $f(x) = \frac{x-5}{x+1}$</p> <p>Denom $\neq 0$</p> <p>Cancel/Hole: $x+1 \neq 0$</p> <p>Stays (VA): $x \neq -1$</p> <p>\therefore VA @ $x = -1$</p>	<p>2. $f(x) = \frac{x+3}{(x+3)(\sqrt{x-2})}$</p> <p>Denom $\neq 0$</p> <p>Cancel/Hole: $x+3 \neq 0$</p> <p>Stays (VA): $\sqrt{x-2} \neq 0$</p> <p>$x \neq -3$</p> <p>$x-2 \neq 0$</p> <p>$x \neq 2$</p> <p>\therefore Hole @ $x = -3$</p> <p>\therefore VA @ $x = 2$</p>	<p>3. $f(x) = \frac{\sqrt{4-x}}{4}$</p> <p>Denom $\neq 0$</p> <p>Cancel/Hole: $4 \neq 0$</p> <p>Stays (VA): $4 \neq 0$</p> <p>\therefore Continuous on domain</p>
<p>4. $f(x) = \frac{x+1}{x^3+5x^2+6x} = \frac{x+1}{x(x+2)(x+3)}$</p> <p>Denom $\neq 0$</p> <p>Cancel/Hole: $x \neq 0$</p> <p>Stays (VA): $x+2 \neq 0$, $x+3 \neq 0$</p> <p>$x \neq -2$, $x \neq -3$</p> <p>\therefore VA @ $x = -3, -2, 0$</p>	<p>5. $f(x) = \frac{2x+1}{2x^2-13x-7} = \frac{2x+1}{(2x+1)(x-7)}$</p> <p>$f(x) = \frac{1}{x-7}$</p> <p>Denom $\neq 0$</p> <p>Hole/Cancel: $2x+1 \neq 0$</p> <p>Stays (VA): $x-7 \neq 0$</p> <p>$x \neq -\frac{1}{2}$, $x \neq 7$</p> <p>\therefore Hole @ $x = -\frac{1}{2}$</p> <p>\therefore VA @ $x = 7$</p>	<p>6. $f(x) = \frac{3x}{3} = x$</p> <p>Denom $\neq 0$</p> <p>Hole/Cancel: $3 \neq 0$</p> <p>Stays (VA): $3 \neq 0$</p> <p>\therefore Continuous on domain</p>

④ Denom $\neq 0$

$$x^3 + 5x^2 + 6x = 0$$

$$x(x^2 + 5x + 6) = 0$$

$$x(x+2)(x+3) = 0$$

⑤ Denom $\neq 0$

$$2x^2 - 13x - 7 \neq 0$$

$$(2x^2 - 14x) + (x - 7) \neq 0$$

$$2x(x-7) + 1(x-7) \neq 0$$

$$(x-7)(2x+1) \neq 0$$

Domain – where the function exists!

<p>The denominator can't be zero.</p>	<p>7. $f(x) = \frac{x-5}{x+1}$</p> <p>Denom $\neq 0$</p> <p>$x+1 \neq 0$</p> <p>$x \neq -1$</p> <p>Interval Notation is cumbersome for this problem.</p> <p>$(-\infty, -1) \cup (-1, \infty)$</p> <p>$\mathbb{R}, x \neq -1$</p>	<p>8. $w(t) = \frac{t+1}{t^3+5t^2+6t}$</p> <p>Denom $\neq 0$</p> <p>$t^3+5t^2+6t \neq 0$</p> <p>$t(t^2+5t+6) \neq 0$</p> <p>$t(t+2)(t+3) \neq 0$</p> <p>$t \neq 0$</p> <p>$t+2 \neq 0$, $t+3 \neq 0$</p> <p>$t \neq -2$, $t \neq -3$</p> <p>$\mathbb{R}, x \neq -3, -2, 0$</p>	<p>9. $b(x) = \frac{1-x}{2}$</p> <p>Denom $\neq 0$</p> <p>$2 \neq 0$</p> <p>\mathbb{R}</p>
<p>Even radicals can't be negative.</p>	<p>10. $g(x) = \sqrt{7x+3}$</p> <p>RADICAND ≥ 0</p> <p>$7x+3 \geq 0$</p> <p>$7x \geq -3$</p> <p>$x \geq -\frac{3}{7}$</p> <p>$[-\frac{3}{7}, \infty)$</p>	<p>11. $f(x) = \frac{x-7}{\sqrt{5-x}}$</p> <p>RADICAND ≥ 0</p> <p>$5-x \geq 0$</p> <p>$-x \geq -5$</p> <p>$x \leq 5$</p> <p>Denom $\neq 0$</p> <p>$\sqrt{5-x} \neq 0$</p> <p>$5-x \neq 0$</p> <p>$x \neq 5$</p> <p>$x < 5$</p> <p>$(-\infty, 5)$</p>	<p>12. $h(x) = \frac{\sqrt{2x-6}}{(x+5)(x-5)}$</p> <p>RADICAND ≥ 0</p> <p>$2x-6 \geq 0$</p> <p>$2x \geq 6$</p> <p>$x \geq 3$</p> <p>Denom $\neq 0$</p> <p>$(x+5)(x-5) \neq 0$</p> <p>$x+5 \neq 0$, $x-5 \neq 0$</p> <p>$x \neq -5$, $x \neq 5$</p> <p>$x \geq 3, x \neq 5$</p> <p>$[3, 5) \cup (5, \infty)$</p>

3.1 Discontinuity and Domain

Write your questions and thoughts here!

Classify all discontinuities AND find the domain.

13. $a(t) = \frac{3t}{t\sqrt{t-5}}$

RADICAND ≥ 0
 $t-5 \geq 0$
 $t \geq 5$

Denom $\neq 0$

Cancel (Hole) $t \neq 0$ \therefore Hole @ $t=0$ Not in Domain	Stays (VA) $\sqrt{t-5} \neq 0$ $t-5 \neq 0$ $t \neq 5$ \therefore VA @ $t=5$ Not in Domain
--	--

Domain: $(5, \infty)$
Discontinuity: Continuous on Domain

14. $h(a) = \frac{5}{2-\sqrt{a}}$

RADICAND ≥ 0
 $a \geq 0$

Denom $\neq 0$

Cancel (Hole) $2 - \sqrt{a} \neq 0$ $2 \neq \sqrt{a}$ $4 \neq a$ \therefore VA

Domain: $[0, 4) \cup (4, \infty)$
DISC out: VA @ $x=4$

Now summarize what you learned!

Discontinuities	Domain
1) Denom = 0 a. factor cancels, Hole! b. factor stays, VA	1) Denom $\neq 0$ 2) Even RADICANDS ≥ 0

3.1 Practice – Discontinuity & Domain

Name: _____

Pre-Calculus

For 1 – 9, find and classify each discontinuity.

1. $f(x) = \frac{x}{x-3}$

Denom = 0

Cancel	Stays $x-3=0$ $x=3$
---------------	----------------------------------

\therefore VA @ $x=3$

2. $g(x) = \sqrt{9+4x}$

Continuous on its domain

3. $h(x) = \frac{x-5}{x^2-4x-5} = \frac{x-5}{(x-5)(x+1)}$

$h(x) = \frac{1}{x+1}$

Denom = 0

Cancel (hole) $x-5=0$ $x=5$	Stays (VA) $x+1=0$ $x=-1$
--	--

\therefore Hole @ $x=5$, \therefore VA @ $x=-1$

4. $a(x) = \frac{2x^2-x-1}{2x^2+5x-3}$

$= \frac{(2x^2-2x)+(x-1)}{(2x^2-x)+(6x-3)} = \frac{2x(x-1)+1(x-1)}{x(2x-1)+3(2x-1)}$

$q(x) = \frac{(x-1)(2x+1)}{(2x-1)(x+3)}$

Denom = 0

Cancel	Stays $2x-1=0$ $2x=1$ $x=\frac{1}{2}$	$x+3=0$ $x=-3$
---------------	---	-------------------

\therefore VA @ $x=-3, \frac{1}{2}$

5. $w(x) = \frac{5x+15}{3}$

CONTINUOUS ON ITS DOMAIN

6. $f(x) = \frac{3x+4}{9x^2-16} = \frac{3x+4}{(3x-4)(3x+4)}$

$f(x) = \frac{1}{3x-4}$

Denom = 0

Cancel $3x+4=0$ $3x=-4$ $x=-\frac{4}{3}$	Stays $3x-4=0$ $3x=4$ $x=\frac{4}{3}$
--	---

\therefore Hole @ $x=-\frac{4}{3}$, \therefore VA @ $x=\frac{4}{3}$