Continuous → defined, limits converge
(y-values on either side of the point are <u>very</u> close)

$x^3 - 3x$ at $x = 4$ continuous

$\sqrt{2x-4}$ $x = 10$ continuous

$\frac{x}{x+7}$ $x = 0$, $x = 7$

@ 0, $\frac{0}{0+7}$ exists continuous

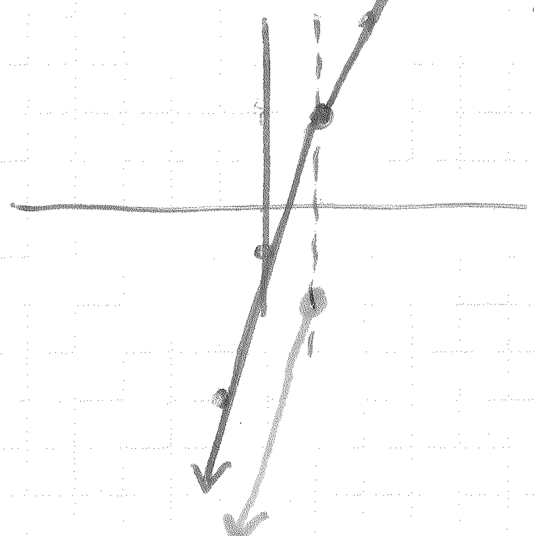
@ 7, $\frac{7}{7+7} = \frac{1}{2}$ exists continuous

@ -7 $\frac{-7}{-7+7} = \frac{-7}{0}$ undefined non-continuous <u>infinite</u>

$f(x) \begin{cases} 3x-1 & \text{if } x<1 \\ 2x & \text{if } x \geq 1 \end{cases}$ ~~f(x)~~ $f(1) = 2$ exists

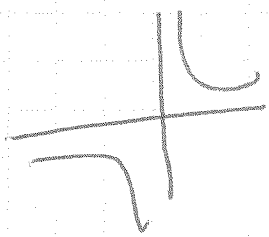
3x-1				2x		
.9	.99	.999	1	1.001	1.01	1.1
1.7	1.97	1.997	2	2.002	2.02	2.2

Continuous



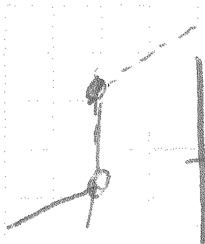
is $\frac{x}{x-7}$ at $x=7$ continuous?

if not, what type of discontinuity



6.99	6.999	7	7.001	7.01
-699	-6999	X	7001	700

Infinite discontinuity



2.9	2.99	2.999	3	3.001	3.01	3.1
6.88	6.9	6.99	7	10	9.99	9.9

Jump

7.9	-7.99	-8	-8.001	-8.01
1.473	1.462	0	1.456	1.443

Removable

$f(x) = \sqrt{x-8} + 5$ inverse?

up 5, Rt 8

rt 5, up 8

$y = \sqrt{x-8} + 5$

$x = \sqrt{y-8} + 5$

Rel Dom (5, 8)

$x \geq 5$

$x - 5 = \sqrt{y-8}$

$(x-5)^2 = y - 8$

$(x-5)^2 + 8 = y \leftarrow f^{-1}(x) = (x-5)^2 + 8$

$x^2 - 10x + 25 + 8 \quad f^{-1}(x) = x^2 - 10x + 33$

odd, even, neither

$f(x)\ x^3-2x$

$f(-x)=(-x)^3-2(-x)$

$f(-x)\ \ -x^3+2x$

$-f(x)=-x^3+2x$

$g(x)$

x^4+8x^2+81

$g(-x)=(-x)^4+8(-x)^2+81$

x^4+8x^2+81

Continuous? Not? if not, Type?

$$f(x)=\begin{cases} 2x & \text{if } x<3 \\ 9-x & \text{if } x\geq 3 \end{cases} \quad \text{at } 3$$

2x			9-x	
2.99	2.999	3	3.001	3.01
5.98	5.998	6	5.999	5.99

yes cont.

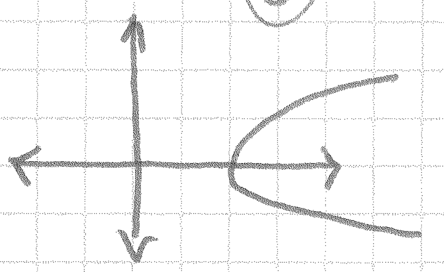
$f(x)=\dfrac{x-3}{x^2-9}$ at $x=3$

2.9	2.99	2.999	3	3.001	3.01	3.1
.17	.167	.1667	X	.1667	.166	.164

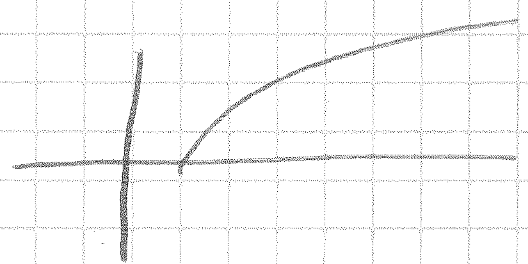
is $x = y^2 - 5$

$y^2 = x - 5$

$y = \pm\sqrt{x-5}$



$y = \sqrt{x+3}$



y-intercepts / zeros

$f(x) = 4x^2 - 8x - 12$ $\quad f(0) = 0 + -0 - 12$

y-intercept = $(0, -12)$

zeros $4(x^2 - 2x - 3)$

$4(x+1)(x-3)$

zeros: $x = 1$, $x = 3$

$(f+g)$ $x-6+x^2-36$

x^2+x-42

$(f-g)$ $x-6-(x^2-36)$

$-x^2+x+30$

$(f\cdot g)$ $(x-6)(x^2-36)$

$x^3-36x-6x^2+216$

$x^3-6x^2-36x+216$

(f/g) $\frac{x-6}{x^2-36}$ $\frac{\cancel{x-6}}{\cancel{(x-6)}(x+6)}$ $x \neq \pm 6$

$\frac{1}{x+6}$

$f(g(x))$ x^2-36-6

x^2-42

$g(f(x)) = (x-6)^2-36$

$x^2-12x+\cancel{36}-\cancel{36}$

x^2-12

Inverse

$$f(x) = \sqrt{x-8} + 5$$

$$y = \sqrt{x-8} + 5$$

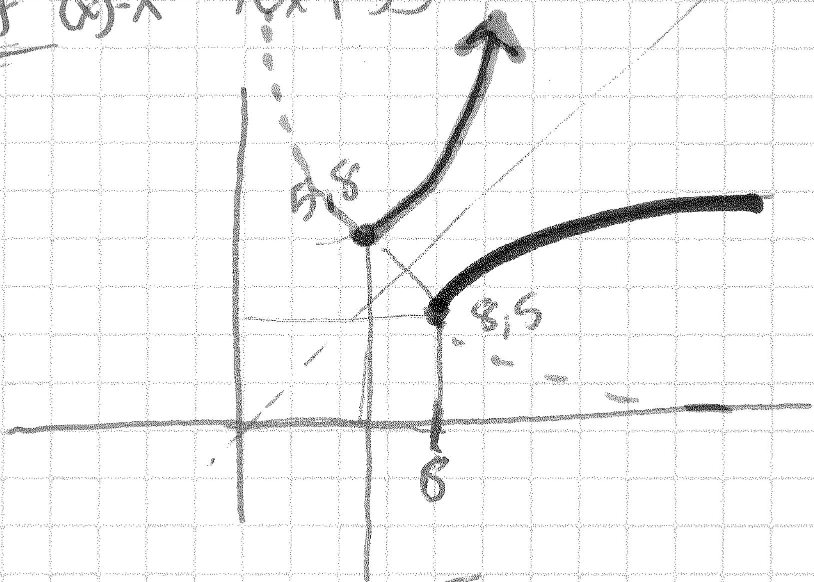
$$x = \sqrt{y-8} + 5$$

$$(x-5)^2 = \left(\sqrt{y-8}\right)^2$$

$$x^2 - 10x + 25 = y - 8$$

$$+5 \qquad +8$$

$$f^{-1}(x) = x^2 - 10x + 33$$



$x \geq 5$

60. $f(x) \frac{x}{x+2}$

Step1 One to One

Step2. $y = \frac{x}{x+2}$

Step 3 $x = \frac{y}{y+2}$

Step 4 $x(y+2) = y$

$xy + 2x = y$

$2x = -xy + y$

$\frac{2x}{(-x+1)} = \frac{y\cancel{(-x+1)}}{\cancel{(-x+1)}}$

$\frac{-xy}{y} + \frac{y}{y}$

$y(-x+1)$

$-xy + y$

$y = \frac{2x}{-x+1}$

Step5 $f(x) = \frac{2x}{-x+1}$

Domain $\rightarrow$ $(-\infty, 1) \cup (1, \infty)$