Continuity
Section 2.3

Continuity at a point:

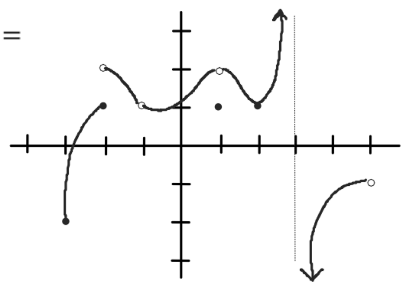
$f(x)$ is continuous at $x = c$ iff

1) $f(c)$ exists

2) $\lim_{x \to c} f(x)$ exists

3) $f(c) = \lim_{x \to c} f(x)$

$f(x) =$



Domain: $[-3,-1)(-1,3)(3,5)$

Points of Discontinuity:

$x = -2, -1, 1, 3, 5$

Why are they points of discontinuity?

$x = -2$ $\lim_{x \to 2} f(x)$ d.n.e.

$x = -1$ $f(-1)$ d.n.e.

$x = 1$ $f(1) \neq \lim_{x \to 1} f(x)$

$x = 3$ $f(3)$ d.n.e.

$x = 5$ $f(5)$ d.n.e.

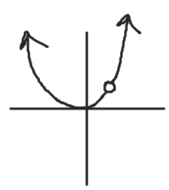
Domain of a Function

non-continuous points
Continuous points

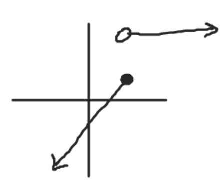
← where you find the derivative of a function

Types of Discontinuity

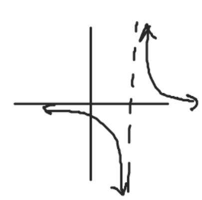
Hole



Jump



Infinite



Name the type of discontinuity within each function

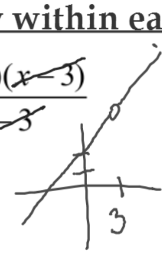
1. $f(x) = \frac{1}{x+3}$

infinite

2. $f(x) = \frac{(x+2)\cancel{(x-3)}}{\cancel{x-3}}$

$= x+2$

hole



3. $f(x) = \begin{cases} 2 & x < -1 \\ 3 & x > -1 \end{cases}$

jump

Continutity of a function

Determine where the function is continuous and discontinuous.

4. $f(x) = \dfrac{x+2}{x+1}$

discont @ $x=-1$

infinite

continuous: $(-\infty,-1)\cup(-1,\infty)$

5. $f(x) = \sqrt{x-2}$

Cont: $[2,\infty)$

6. $f(x) = \sqrt{5-3x}$

$5-3x \geq 0$

$-3x \geq -5$

$x \leq \frac{5}{3}$

cont. on $\left(-\infty, \frac{5}{3}\right]$

7. $f(x) = x^2 + 5$

cont. $(-\infty,\infty)$

8. $f(x) = \ln(1-x)$

discont. @ $x=1$

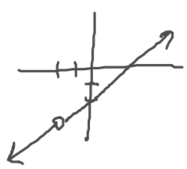
infinite discon.

cont. on $(-\infty,1)$

For problems with removable discontinuity (#25-29)

Give the formula for the extended function that is continuous at the indicated point.

9. $f(x) = \dfrac{x^2-4}{x+2}$



Plan A

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

$$\boxed{f(x) = x-2}$$

Plan B

$$f(x) = \begin{cases} \dfrac{x^2-4}{x+2} & \text{when } x \neq -2 \\ -4 & \text{when } x = -2 \end{cases}$$