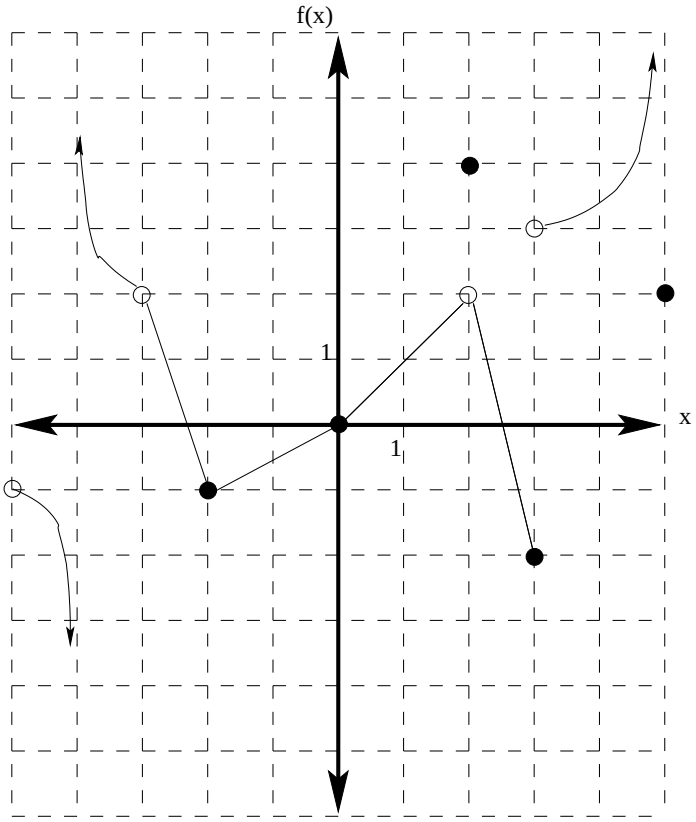
Math 229
Limits and Continuity
02/07/2007

**Example:**




Find the following:

1. $f(2)$
2. $\lim_{x \to -2} f(x)$
3. $\lim_{x \to 2} f(x)$
4. $\lim_{x \to 3^+} f(x)$
5. $\lim_{x \to 3^-} f(x)$
6. $\lim_{x \to 3} f(x)$
7. $f(5)$
8. $\lim_{x \to 5^-} f(x)$
9. $f(-3)$

**Definition:**
A function $f$ is **continuous at the point** $x = a$ if the following hold:

1. $f(a)$ is defined
2. $\lim_{x \to a} f(x)$ exists (that is both its one-sided limits exist and agree)
3. $\lim_{x \to a} f(x) = f(a)$

**Question:** At what point(s) is the function above discontinuous?

**Notes:**

1. Constant functions and polynomial functions are contiuous everywhere.
2. Rational functions $R(x) = \frac{f(x)}{g(x)}$, with $f$ and $g$ polynomials are continuous except where $g(x) = 0$.
3. If two functions $f$ and $g$ are continuous at a point $a$, then so are: $f \pm g$, $fg$, and $\frac{f}{g}$ (provided $g(a) \neq 0$.