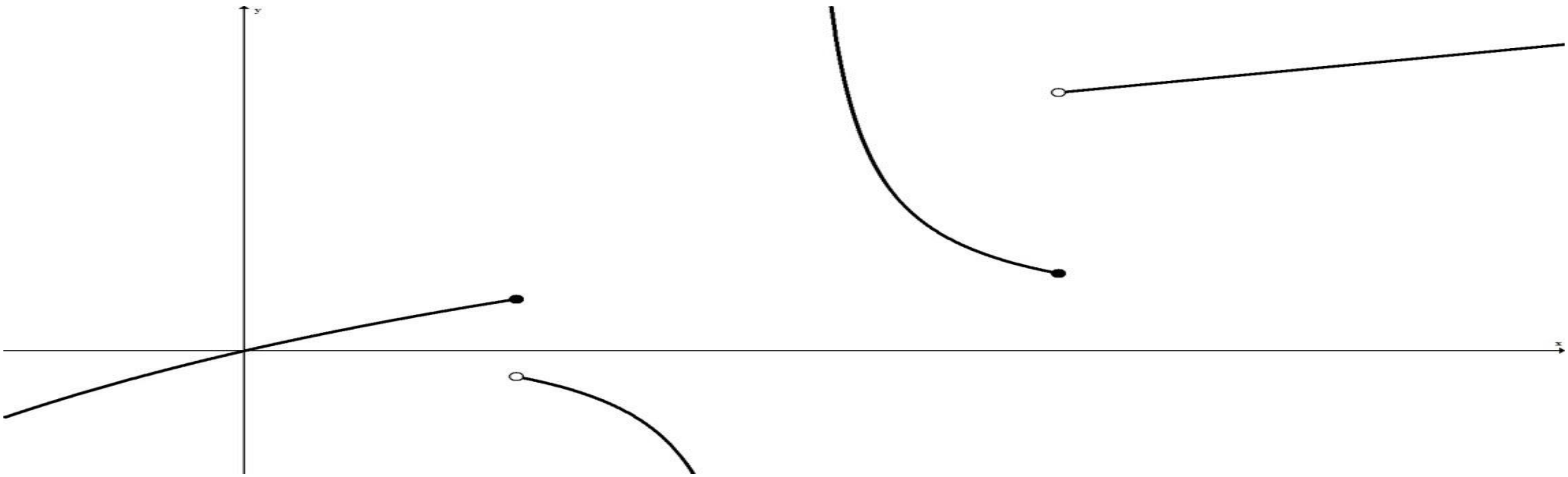
Closing Today: 2.1
Closing Fri: 2.2
Closing Mon: 2.3 (start now)
Note: No class Monday (MSC is closed!)

Entry Task: Find the limits

$$f(x) = \begin{cases} \dfrac{12x}{x+5} & \text{, if } x \le 1; \\ \dfrac{x}{x-2} & \text{, if } 1 < x \le 3 \text{ and } x \ne 2; \\ \dfrac{x^2+4x-21}{x-3} & \text{, if } x > 3. \end{cases}$$

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

Here is a picture of f(x)



Limit Flow Chart for

$$\lim_{x \to a}\left[\frac{f(x)}{g(x)}\right]$$

1. Try plugging in the value.
   If denominator ≠ 0, done!

2. **If denom = 0 & numerator ≠ 0**:
   Answer is -∞, +∞ or DNE.
   Examine the sign (pos/neg).

3. **If denom = 0 & numerator = 0**,
   Use algebraic methods to simplify and cancel until one of them is not zero.

For the den = 0, num = 0 case, here is a some algebra to try:

Strategy 1: Factor/Cancel
Strategy 2: Simplify Fractions
Strategy 3: Expand/Simplify
Strategy 4: Multiply by Conjugate
Strategy 5: Change Variable
Strategy 6: Compare to other functions (Squeeze Thm)

Aside: The den = 0, num = 0 case is often called an **indeterminate form**. Besides $\frac{0}{0}$, some other indeterminate forms include

$$\frac{\infty}{\infty}\ ,\infty - \infty\ ,1^{\infty}, 0 \cdot \infty, \infty^{0}$$

2.5 Continuity

A function, f(x), is **continuous at x = a** if

$$\lim_{x \to a} f(x) = f(a)$$

this implies three things

1. f(a) is defined.
2. $\lim_{x \to a} f(x)$ exists and is finite
3. They are the same!

Casually, we might say a function is continuous at *x* = *a* if you can draw the graph across *x* = *a* point without picking up your pencil.

Our textbook also defines:

Continuous from the left

$$\lim_{x \to a^-} f(x) = f(a)$$

Continuous from the right

$$\lim_{x \to a^+} f(x) = f(a)$$