JAN

$$f(x)=\begin{cases} 3^x & \text{for } x \le -1 \\ 3x-2 & \text{for } -1 < x \le 2 \\ x^2 & \text{for } x > 2 \end{cases}$$

$\lim_{x\to 2} f(x) = 4$

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

$\lim_{x\to 2^-} f(x) = \lim_{x\to 2^-} 3x-2$

$= 3(2)-2 = 4$

$\lim_{x\to 2^+} f(x) = \lim_{x\to 2^+} x^2$

$= 2^2 = 4$

$\lim_{x\to -1^-} f(x) = \lim_{x\to -1^-} 3^x$

$= 3^{-1} = \frac{1}{3}$

$\lim_{x\to -1^+} f(x) = \lim_{x\to -1^+} 3x-2$

$= 3(-1)-2 = -5$

JANUARY 29

Students will verbally explain how to evaluate limits

(using the words: factor, simplify, evaluate...)

Let f be the function defined by

$$f(x)=\begin{cases}\sqrt{x+1} & \text{for } 0\le x\le 3\\ 5-x & \text{for } 3<x\le 5\end{cases}$$

(a) Is f continuous at $x=3$? Explain why or why not.

$\sqrt{3+1}=2$

$5-3=2$

$\lim\limits_{x\to 3^-} f(x)=\sqrt{3+1}=2$

$\lim\limits_{x\to 3^+} f(x)=5-3=2$

$f(3)=\sqrt{3+1}=2$

$f(a)$ exists

$\lim\limits_{x\to a} f(x)$ exists

$f(a)=\lim\limits_{x\to a} f(x)$

$$f(x)=\begin{cases}\sqrt{x+1} & \text{for } 0\le x\le 3\\ 5-x & \text{for } 3<x\le 5\end{cases}$$

(b) How would you change f so that there is a removable discontinuity at $x=3$? Explain how you know there is a removable discontinuity.

$$f(x)=\begin{cases}\sqrt{x+1} & \text{for } 0\le x<3\\ 5-x & \text{for } 3<x\le 5\\ 7 & x=3\end{cases}$$

$\lim\limits_{x\to 3^-} f(x)=\lim\limits_{x\to 3^+} f(x)$

$f(3)\neq \lim\limits_{x\to 3} f(x)$ exists

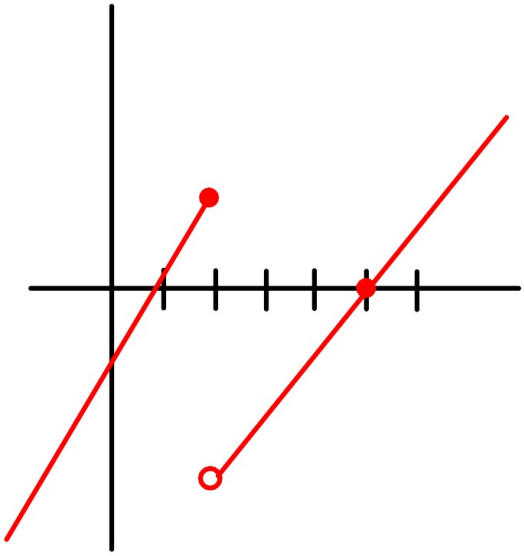
(c) $g(x)$ is a function with the following properties:

- $\lim_{x\to 5^-} g(x) = \lim_{x\to 5^-} f(x)$
- $g(x)$ has a jump discontinuity at $x = 2$

$$f(x) = \begin{cases} \sqrt{x+1} & \text{for } 0 \le x \le 3 \\ 5 - x & \text{for } 3 < x \le 5 \end{cases}$$

Sketch a possible graph of $g(x)$.

$\lim_{x\to 5^-} f(x) = 5 - 5 = 0$



pts	1	2	3	4	5	6	7	8	9
%	55	60	70	75	80	85	90	95	100