2 Pages **Quiz 3A**, Math 1850 Section 011
9-18-14 Solutions Name _____

(12) 1. Find the limit, if it exists.

(a) $\lim_{t\to 1} \dfrac{t^2+t-2}{t^2-1} \left(= \dfrac{0}{0}\right) = \lim_{t\to 1} \dfrac{(t-1)(t+2)}{(t-1)(t+1)} = \lim_{t\to 1} \dfrac{t+2}{t+1} = \dfrac{3}{2}$

(b) $\lim_{x\to 1} \dfrac{\frac{1}{x}-1}{x-1} \left(= \dfrac{0}{0}\right) = \lim_{x\to 1} \dfrac{x}{x}\dfrac{\frac{1}{x}-1}{x-1} = \lim_{x\to 1} \dfrac{1-x}{x(x-1)} = \lim_{x\to 1} \dfrac{-1}{x} = -1$

(c) $\lim_{y\to 0} \dfrac{\sin 3y}{4y} \left(= \dfrac{0}{0}\right) = \dfrac{3}{4} \lim_{y\to 0} \dfrac{\sin 3y}{3y} = \dfrac{3}{4}(1) = \dfrac{3}{4}$

(d) $\lim_{x\to -2^-} (x+3)\dfrac{|x+2|}{x+2} = \lim_{x\to -2^-} (x+3) \lim_{x\to -2^-} \dfrac{|x+2|}{x+2} = 1 \lim_{x\to -2^-} \dfrac{-(x+2)}{x+2} = -1$ because $|x+2| = -(x+2)$ since $x < -2$ (because it is a limit from the left).

2. Use the graph of the greatest integer function $y = \lfloor x \rfloor$ to help you find $\lim_{t\to 4^-} (t - \lfloor t \rfloor)$ (The correct limit gets full credit; otherwise the graph of $y = \lfloor t \rfloor$ will receive partial
(4) credit.)

The graph of $y = \lfloor x \rfloor$ is Figure 1.10 on page 5 of the text (Thomas 12th ed.). If $3 \le t < 4$ then $\lfloor t \rfloor = 3$ and so

$$\lim_{t\to 4^-} (t - \lfloor t \rfloor) = \lim_{t\to 4^-} t - \lim_{t\to 4^-} \lfloor t \rfloor = 4 - 3 = 1$$

(4) 3. Graph the function f. Then answer the questions

(a) At what points c, if any, does $\lim_{x\to c} f(x)$ exist?
See the graph: $\lim_{x\to c} f(x)$ exists for every c, $0 < c < 3$ except $c = 1$ and $c = 2$.

(b) At what points $0 < c < 3$ does the left hand limit $\lim_{x\to c-} f(x)$ exist but $\lim_{x\to c} f(x)$ does not exist?
At both $c = 1$ (where $\lim_{x\to 1-} f(x) = 0$ and $c = 2$ where $\lim_{x\to 2-} f(x) = 1$

$$f(x) = \begin{cases} \sqrt{1-x^2} & \text{if} \quad 0 < x < 1 \\ 1 & \text{if} \quad 1 \le x < 2 \\ 2 & \text{if} \quad 2 \le x < 3 \end{cases} .$$