2 Pages **Quiz 3B**, Math 1850 Section 012

9-18-14 Solutions Name ____________

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

(a) $\lim_{x\to-2} \frac{-2x-4}{x^3+2x^2} \left(=\frac{0}{0}\right) = -2\lim_{x\to-2} \frac{x+2}{x^2(x+2)} = -2\lim_{x\to-2}\frac{1}{x^2} = \frac{-2}{4} = -\frac{1}{2}$

(b) $\lim_{u\to1} \frac{u^4-1}{u^3-1} \left(=\frac{0}{0}\right) = \lim_{u\to1} \frac{(u-1)(u+1)(u^2+1)}{(u-1)(u^2+u+1)} \lim_{u\to1} \frac{(u+1)(u^2+1)}{(u^2+u+1)} = \frac{4}{3}$

(c) $\lim_{x\to0} \frac{\tan 2x}{x} \left(=\frac{0}{0}\right) = 2\lim_{x\to0} \frac{\tan 2x}{2x} 2(1) = 2$

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

2. Use the graph of the greatest integer function $y = \lfloor x \rfloor$ to help you find $\lim_{\theta\to3^-} \frac{\lfloor\theta\rfloor}{\theta}$ (The correct limit gets full credit; otherwise the graph of $y = \lfloor x \rfloor$ will receive
(4) partial credit.)

The graph of $y = \lfloor x \rfloor$ is Figure 1.10 on page 5 of the text (Thomas 12th ed.). If $2 \le \theta < 3$ then $\lfloor\theta\rfloor = 2$ and so

$$\lim_{\theta\to3^-} \frac{\lfloor\theta\rfloor}{\theta} = \frac{\lim_{\theta\to3^-}\lfloor\theta\rfloor}{\lim_{\theta\to3^-}\theta} = \frac{2}{3}$$

(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 below. $\lim_{x\to c} f(x)$ exists at every point c except $c = -1$ and $c = 1$.

(b) At what points does only the right hand limit exist?

Certainly the right hand limit exists at every point the limit exists and also at $c = -1$ (where $\lim_{x\to-1^+} f(x) = -1$) and at $c = 1$ (where $\lim_{x\to1^+} f(x) = 0$).

$$f(x) = \begin{cases} x & \text{if} \quad -1 \le x < 0 \text{ or } 0 < x \le 1 \\ 1 & \text{if} \quad x = 0 \\ 0 & \text{if} \quad x < -1 \text{ or } x > 1 \end{cases}.$$