MATH 151
Bonny J. Tighe

QUIZ 1

2.1-2.4
25 points

NAME Answers

SECTION ________ Fri 2/10/06

1. Using the given graph, find the following:

a) $\lim_{x\to -3} f(x) =$ DNE

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

c) $\lim_{x\to 2} f(x) =$ 1

d) $\lim_{x\to 0} f(x) =$ 0

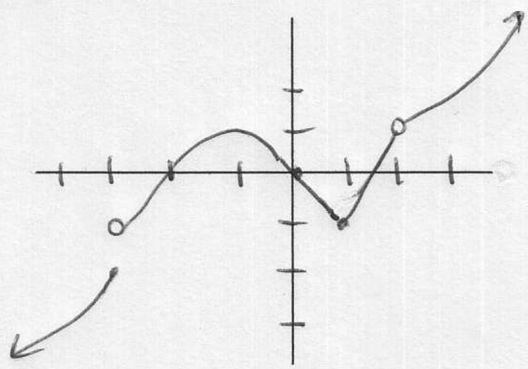
e) $f(-3) =$ -2

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

g) $f(0) =$ 0

h) $\lim_{x\to -3^+} =$ -1

i) $\lim_{x\to 1} =$ -1



2. Prove the following limit using the precise definition of a limit. $\lim_{x\to 2}(x^2-1)=3$

$\lim_{x\to a} f(x)=L$ if for any $\varepsilon>0$ there exists a $\delta>0$ so that $|f(x)-L|<\varepsilon$ whenever $|x-a|<\delta$

$|x^2-1-3|<\varepsilon$ whenever $|x-2|<\delta$

$|x^2-4|<\varepsilon$

$|x+2|\cdot|x-2|<\varepsilon$

$|x-2|<\varepsilon/|x+2|$

let $\delta=1$ so

$|x-2|<1$ (add 4)

$|x+2|<5$

$|x-2|<\varepsilon/5$ so choose $\delta=\min\{1,\varepsilon/5\}$

Check: $|x-2|<\varepsilon/5 \rightarrow 5|x-2|<\varepsilon \rightarrow |x+2|\cdot|x-2|<\varepsilon \rightarrow$
$|x^2-4|<\varepsilon \rightarrow |x^2-1-3|<\varepsilon$ ✓

4. If $\lim_{x\to 2} f(x) = 2$ and $\lim_{x\to 2} g(x) = 3$, find $\lim_{x\to 2}(2\sqrt{fg^2})(x) =$ $6\sqrt{2}$

$2\sqrt{2(3)^2} =$

3. The displacement in meters of a particle moving in s straight line is given by $s(t) = t^2 - 2t + 10$, where t is measured in seconds. a) Find the average velocity of the particle over the time interval $1 \leq t \leq 2$ and then on the interval $2 \leq t \leq 3$. b) Estimate the instantaneous velocity of the particle when t=2 sec.

$s(1) = 1-2+10 = 9$
$s(2) = 4-4+10 = 10$
$s(3) = 9-6+10 = 13$

a) $\frac{s(2)-s(1)}{2-1} = \frac{10-9}{1} = 1$ m/sec

b) $\frac{s(3)-s(2)}{3-2} = \frac{13-10}{1} = 3$ m/sec

b) 2 m/sec

5. Find the following limits:

a) $\lim_{x \to 0} (\sin x - 2\cos 2x) =$ -2

$0 - 2(1)$

b) $\lim_{x \to 4} \frac{x^2 - 16}{4 - x} =$ -8

$\frac{(x+4)\cancel{(x-4)}}{\cancel{4-x}}$ $\lim_{x \to 4} -(x+4) = -8$

c) $\lim_{x \to 0} \frac{2 - \sqrt{4-x}}{x} =$ $1/4$

$\lim_{x \to 0} \frac{2-\sqrt{4-x}}{x}\left(\frac{2+\sqrt{4-x}}{2+\sqrt{4-x}}\right) =$

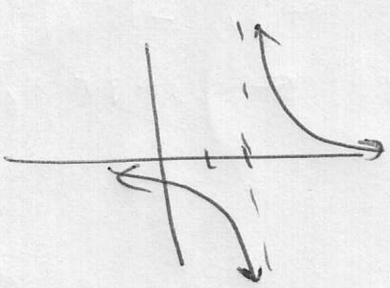
$\lim_{x \to 0} \frac{4-(4-x)}{x(2+\sqrt{4-x})} = \frac{\cancel{x}}{\cancel{x}(2+\sqrt{4-x})}$

d) $\lim_{h \to 0} \frac{(2+h)^{-1} - 2^{-1}}{h} =$ $-1/4$

$\lim_{h \to 0} \frac{\frac{1}{2+h} - \frac{1}{2}}{h} = \lim_{h \to 0} \frac{2-(2+h)}{2(2+h)h} =$

$\lim_{h \to 0} \frac{-\cancel{h}}{2(2+h)\cancel{h}} = \lim_{h \to 0} \frac{-1}{2(2+h)} = \frac{-1}{4}$

e) $\lim_{m \to 2} \frac{3}{m-2} =$ DNE



f) $\lim_{x \to 1^-} f(x) =$ -1 if $f(x) = \begin{cases} x^2 - 2 \text{ if } x < 1 \\ \sqrt{x} \text{ if } x \geq 1 \end{cases}$