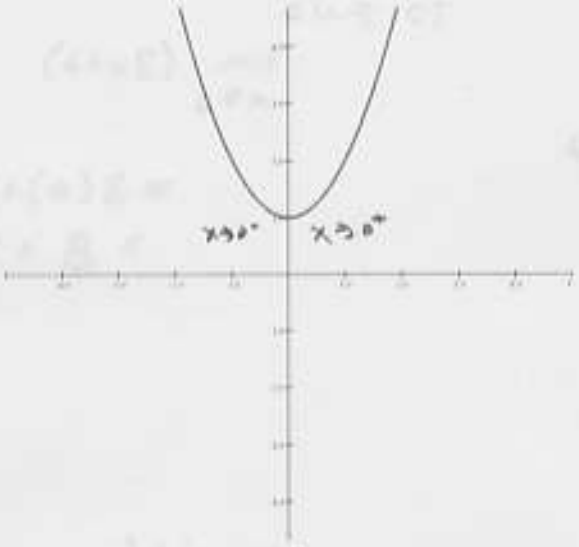
Math 113
Quiz 2 (2.1-2.2)

Key

1) Use the graphs to find the limit (if it exists) If the limit does not exist explain why? (15 pts.)

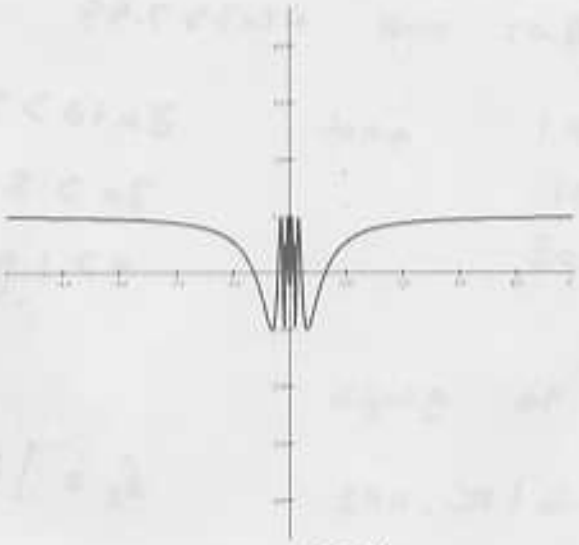
a)



$$\lim_{x\to 0}(x^2+1) = 1$$

7

b)



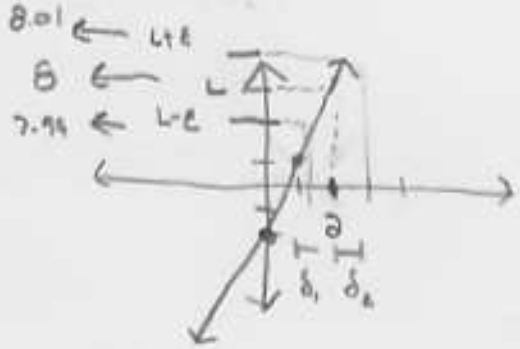
$$\lim_{x\to 0}\cos\left(\frac{1}{x}\right)$$

8

limit does not exist because function is oscillating between fixed points as x approaches 0

2) Find the limit L Then find $\delta>0$ such that $|f(x)-L| < .01$ whenever $0 < |x-c| < \delta$

$\lim_{x\to 2}(3x+2)$ (25 pts.) (Hint: to find the limit you can use direct substitution.)



TO FIND $\lim_{x\to 2}(3x+2)$ can use direct substitution.

$= 3(2)+2$

$= 8 = L$ /10

TO FIND δ:

method 1.

$|f(x)-L| < .01$ whenever $|x-c| < \delta$

From graph above, I see that my x values must be chosen so $f(x) < 8.01$ and $f(x) > 7.99$

$3x+2 < 8.01$ and $3x+2 > 7.99$

$3x < 6.01$ $3x > 5.99$

$x < 2.00\overline{3}$ $x > 1.99\overline{6}$ /15

TO Figure out δ on the graph

$\delta_1 = |2.00\overline{3} - 2| \approx .003$ $\delta_2 = |2 - 1.99\overline{6}| \approx .004$

TAKE the smaller of two to guarantee so

$\delta = .00\overline{3} = \frac{1}{300}$

method 2:

$|f(x)-L|<\varepsilon$ whenever $|x-c|<\delta$

$|3x+2-(8)|<\varepsilon$ whenever $|x-2|<\delta$

choose ε and find restriction on $|x-2|<\delta$

$|3x+2-8|<\varepsilon$

$|3x-6|<\varepsilon$

$|3(x-2)|<\varepsilon$

$|3||x-2|<\varepsilon$

$|x-2|<\frac{\varepsilon}{3}$ but $\varepsilon=.01$

$|x-2|<\frac{.01}{3}$

$|x-2|<\frac{1}{100}\cdot\frac{1}{3}$

$\boxed{|x-2|<\frac{1}{300}} \Rightarrow \delta=\frac{1}{300}$

check:

$|x-2|<\frac{.01}{3} \Rightarrow 3|x-2|<.01$

$|3x-6|<.01$

$|3x+2-8|<.01$

$|(3x+2)-8|<.01$

$|f(x)-L|<.01$