Math 221 Worksheet 2

Tuesday September 13 2016

1

Evaluate the following limits if they exist

- $\lim_{x\to 2} x^2 + 2$

- $\lim_{x\to 2} f(x)$ where
$$f(x) = \frac{x^3 - 2x^2 + 2x - 4}{x - 2}$$

- $\lim_{x\to 2} g(x)$ where
$$g(x) = \begin{cases} x^2 + 4 & x \leq 2 \\ x^3 + 5x^2 - 2x - 24 & x > 2 \end{cases}$$

- $\lim_{x\to 2} l(x)$ where
$$l(x) = \begin{cases} x^2 + 4 & x \leq 2 \\ x^3 + 5x^2 - 2x - 22 & x > 2 \end{cases}$$

2 Some larger questions about functions and limits

- Are the functions x^2+2 and $f(x) = \frac{x^3-2x^2+2x-4}{x-2}$ above the same function? Why or why not? That is, if they're different, list as many things as you can that make them different. If they're the same, what exactly do we mean by same?

- Do these functions from the part above, x^2+2 and $\frac{x^3-2x^2+2x-4}{x-2}$, have the same limit everywhere? That is, I give you a point a, a real number, and I'm asking, is the following equality

$$\lim_{x\to a} x^2 + 2 = \lim_{x\to a} \frac{x^3 - 2x^2 + 2x - 4}{x - 2}$$

  true?

- What are some ways a limit can fail to exist? If we look at a graph of a function, how can we tell whether or not a limit exists? List as many ways or examples as you can. Draw some pictures of functions that don't have limits at particular points, the point 0 for example.