One Sided Limits

OneSidedLimits.tns

Name ________________________

Class ________________________

Problem 1

Estimate the following limits before moving the slider.

1. $\lim_{x\to 0^-} \mathbf{f1}(x) \approx$ __________
2. $\lim_{x\to 0^+} \mathbf{f1}(x) \approx$ __________
3. Use the slider to graphically estimate the value of *a* that will ensure that $\lim_{x\to 0} \mathbf{f1}(x)$ exists. About what is this value of *a*?

Problem 2

Estimate the following limits before moving the slider.

1. $\lim_{x\to 1^-} \mathbf{f1}(x) \approx$ __________
2. $\lim_{x\to 1^+} \mathbf{f1}(x) \approx$ __________
3. Use the slider to graphically estimate the value of *a* that will ensure that $\lim_{x\to 1} \mathbf{f1}(x)$ exists. About what is this value of *a*?
4. Is the data in the function table on page 2.2 consistent or inconsistent with the value of *a* that ensures that $\lim_{x\to 1} \mathbf{f1}(x)$ exits? In other words, do the values of the function to the left of 1 and to the right of 1 appear to be approaching the same number?
5. Algebraically find the value of *a* that ensures that $\lim_{x\to 1} \mathbf{f1}(x)$ exists.

Problem 3

Estimate the following limits before moving the slider.

1. $\lim_{x\to 2^-} \mathbf{f1}(x) \approx$ __________
2. $\lim_{x\to 2^+} \mathbf{f1}(x) \approx\ \approx$ __________

3. Use the slider to graphically estimate the value of *a* that will ensure that $\lim_{x\to 2} \mathbf{f1}(x)$ exists. At what value of *a* does $\lim_{x\to 2} \mathbf{f1}(x)$ exist?

4. Is the data in the function table on page 3.2 consistent or inconsistent with the value of *a* that ensures that $\lim_{x\to 2} \mathbf{f1}(x)$ exits?

5. Algebraically find the value of *a* that ensures that $\lim_{x\to 2} \mathbf{f1}(x)$ exists.

Extension – Continuity

A function is continuous at $x = c$ if:

- *f*(c) exists
- $\lim_{x\to c} f(x)$ exists, and
- $\lim_{x\to c} f(x) = f(c)$

For the functions in Problems 1–3, is the function continuous at the given *x*-value, given the value of *a* that you found earlier? Explain your reasoning. If the function is not continuous, is it possible to modify the first branch of the piecewise function to make the function continuous at the given value?

1. Problem 1: $f(x) = \begin{cases} 1, & x \le 0 \\ a, & x > 0 \end{cases}$ at $x = 0$

2. Problem 2: $f(x) = \begin{cases} x+2, & x < 1 \\ ax^2, & x > 1 \end{cases}$ at $x = 1$

3. Problem 3: $f(x) = \begin{cases} 2\sin\left(\frac{\pi}{2}(x-1)\right), & x < 2 \\ 3\sin\left(\frac{\pi}{2}(x-4)\right) + a, & x > 2 \end{cases}$ at $x = 2$

