

Quiz #1

Name: Solutions Inc.

Wednesday, September 14, 2016

Math 140, Prof. Beydler

Directions: Show all work. No books or notes. A **scientific calculator** is allowed. Your desk and lap must be clear (no phones, notebooks, etc.). Write your answers in the indicated places, or box your answers. Good luck!

Note: If any limits are $+\infty$ or $-\infty$, say so to get full credit.

1. (2 points) Find the following:

$$\lim_{x \rightarrow -1^+} \frac{x-3}{x+1}$$

top $\rightarrow -4$
bot $\rightarrow 0, \text{ pos}$

Answer: $-\infty$

2. (2 points) Find the following:

$$\lim_{x \rightarrow \frac{1}{2}} \frac{2x^2 + 5x - 3}{2x - 1}$$

$$= \lim_{x \rightarrow \frac{1}{2}} \frac{\cancel{(2x-1)}(x+3)}{\cancel{(2x-1)}}$$

$$= \lim_{x \rightarrow \frac{1}{2}} (x+3)$$

$$= \frac{1}{2} + 3$$

Answer: $\frac{7}{2}$

3. (2 points) Find the following (be sure to show how you got your answer):

$$\lim_{x \rightarrow 5} \frac{x+2}{x-5}$$

$$\lim_{x \rightarrow 5^-} \frac{x+2}{x-5} = -\infty \quad \begin{array}{l} \text{top} \rightarrow 7 \\ \text{bot} \rightarrow 0, \text{ neg} \end{array}$$

$$\lim_{x \rightarrow 5^+} \frac{x+2}{x-5} = +\infty \quad \begin{array}{l} \text{top} \rightarrow 7 \\ \text{bot} \rightarrow 0, \text{ pos} \end{array}$$

Answer: DNE

4. (2 points) Find the following (be sure to show how you got your answer):

$$\lim_{x \rightarrow \infty} \frac{x^3 - 2x^2 + 1}{5x^2 + 3x - 7}$$

$$= \lim_{x \rightarrow \infty} \frac{x - 2 + \frac{1}{x^2}}{5 + \frac{3}{x} - \frac{7}{x^2}}$$

top $\rightarrow +\infty$
bot $\rightarrow 5$

Answer: $+\infty$

$$= +\infty$$

5. Let $f(x) = \begin{cases} \frac{1}{x} & \text{if } x < 0 \\ 2x + 1 & \text{if } x \geq 0 \end{cases}$
- a) (1 point) Find $\lim_{x \rightarrow 0^+} f(x)$.

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

Answer: 1

- b) (1 point) Is $f(x)$ continuous at $x = 0$? Why or why not? (Be sure to use the definition of continuous.)

$$\lim_{x \rightarrow 0^-} f(x) = \lim_{x \rightarrow 0^-} \frac{1}{x} = -\infty$$

Yes No (circle one)

but $\lim_{x \rightarrow 0^+} f(x) = 1$

So, $\lim_{x \rightarrow 0} f(x)$ DNE. Thus $f(x)$ is not continuous at $x = 0$.

6. (1 point) List all values of x for which $f(x) = \frac{2x-3}{x^2-9}$ is not continuous.

$$\begin{aligned} x^2 - 9 &= 0 \\ (x+3)(x-3) &= 0 \\ \downarrow \quad \downarrow & \\ x = -3 \quad x = 3 & \end{aligned}$$

Answer: -3, 3

7. (4 points) Based on the graph of $f(x)$ shown to the right, find each of the following:

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

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

$$\lim_{x \rightarrow 2} f(x) \text{ DNE}$$

$$\lim_{x \rightarrow 4^-} f(x) = 3$$

$$\lim_{x \rightarrow 4^+} f(x) = 3$$

$$\lim_{x \rightarrow 4} f(x) = 3$$

$$\lim_{x \rightarrow +\infty} f(x) = 3$$

Is $f(x)$ continuous at $x = 3$? Yes or No (circle one)

