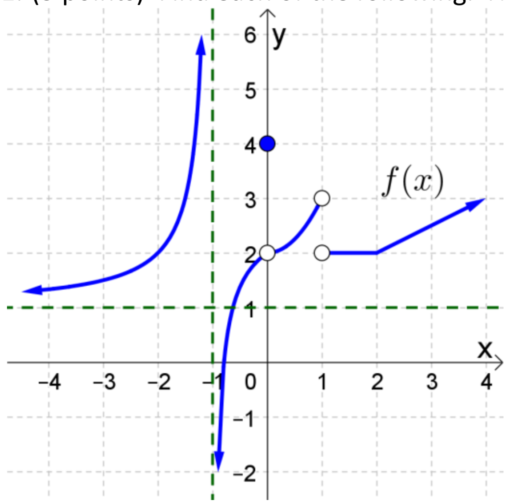
_____ / 20 total points

Quiz #1 Name: ______________________________

Math 180, Section 7, Prof. Beydler Thursday, September 14, 2017

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!

1. (3 points) Find each of the following. No need to show work here.



$\lim_{x\to 0} f(x) = 2$ $\lim_{x\to 1^-} f(x) = 3$

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

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

2. (3 points) Given the graph of f in the previous problem, answer the following. Be sure to explain your answers for full credit.

Is f continuous or discontinuous at $x = -2$? continuous or discontinuous (circle one)

Why? $\lim_{x\to -2} f(x) = 2 = f(-2)$

Is f continuous from the left at $x = 1$? yes or no (circle one)

Why or why not? $f(1)$ is undefined

3. (2 points) Find the following.

$\lim_{x\to -1} \frac{x}{(x+1)^2}$

$\frac{\text{top} \to -1}{\text{bot} \to 0, \text{ pos}}$

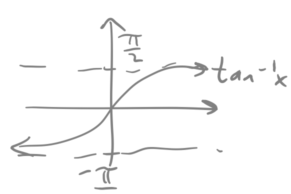
Answer: $-\infty$

4. (2 points) Find the following.

$\lim_{x\to 2^-} \tan^{-1}\left(\frac{1}{x-2}\right)$

$x-2 \to 0$, neg

$\frac{1}{x-2} \to -\infty$



Answer: $-\frac{\pi}{2}$

5. (2 points) Find the following.

$\lim_{x\to 5} \frac{x-5}{2x^2-9x-5} = \lim_{x\to 5} \frac{\cancel{x-5}}{(2x+1)\cancel{(x-5)}} = \lim_{x\to 5} \frac{1}{2x+1} = \frac{1}{2(5)+1}$

Answer: $\frac{1}{11}$

6. (2 points) Find the following.
$\lim_{x\to\infty}\left(2x-\sqrt{4x^2-5}\right)$ ← Type $\infty-\infty$

$$=\lim_{x\to\infty}\frac{\left(2x-\sqrt{4x^2-5}\right)\left(2x+\sqrt{4x^2-5}\right)}{(1)\left(2x+\sqrt{4x^2-5}\right)}$$

$$=\lim_{x\to\infty}\frac{4x^2-(4x^2-5)}{2x+\sqrt{4x^2-5}}$$

$$=\lim_{x\to\infty}\frac{5}{2x+\sqrt{4x^2-5}}$$

$\frac{\text{top}\to 5}{\text{bot}\to\infty}$

Answer: 0

7. (2 points) Use the Squeeze Theorem to prove that $\lim_{x\to 0} x^2\sin\left(\frac{3}{x}\right)=0$.

$$-1\le\sin\left(\tfrac{3}{x}\right)\le 1$$

$$-x^2\le x^2\sin\left(\tfrac{3}{x}\right)\le x^2$$

Since $\lim_{x\to 0}(-x^2)=\lim_{x\to 0}x^2=0$,
we have $\lim_{x\to 0}x^2\sin\left(\frac{3}{x}\right)=0$ by the Squeeze Theorem. ▨

8. (2 points) How would you define $f(3)$ in a way that makes $f(x)=\frac{x^2-2x-3}{x-3}$ continuous at $x=3$?

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

Let $f(3)=$ 4

9. (2 points) Sketch the graph of an example of a function f that satisfies $\lim_{x\to -3}f(x)=-\infty$, $\lim_{x\to 1^+}f(x)=5$, $\lim_{x\to\infty}f(x)=2$, and $f(-1)=4$. Be sure to draw any asymptotes of f.