MATH 150/GRACEY NAME_____

EXAM 1/CHAPTER 1

100 POINTS POSSIBLE

YOUR WORK MUST SUPPORT YOUR ANSWER FOR FULL CREDIT TO BE AWARDED!

NO GRAPHING CALCULATOR AND NO DECIMALS

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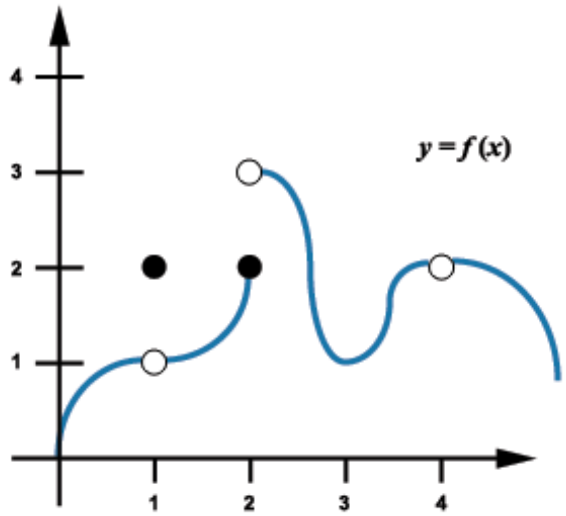
1. (8 POINTS, 2 POINTS EACH) Use the graph of $y = f(x)$ shown below to find each limit, if it exists. **If the limit does not exist, explain why**.



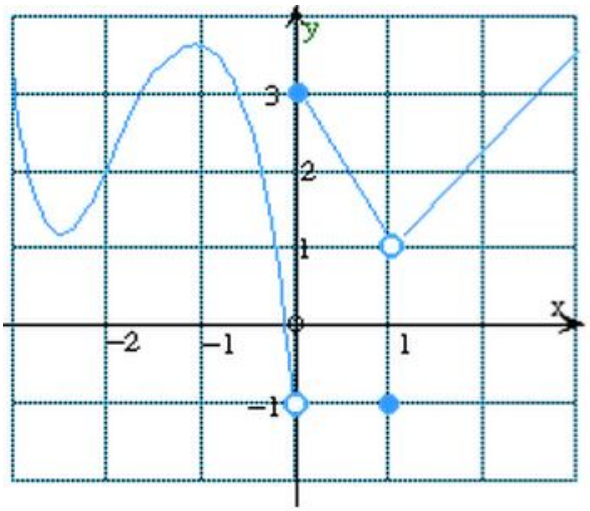
a. $\lim_{x \to 2} f(x) =$ _____

b. $\lim_{x \to 1^-} f(x) =$ _____

c. $\lim_{x \to 1^+} f(x) =$ _____

d. $\lim_{x \to 1} f(x) =$ _____

2. (6 POINTS) Consider the function shown below. Is this function continuous at $x = 0$? EXPLAIN using the **3 conditions** for continuity at a point!



1.

2.

3.

Circle one:

continuous at $x = 1$ not continuous at $x = 1$

3. (6 POINTS) Find the limit L. Then find $\delta > 0$ such that $\left|f(x) - L\right| < 0.01$ whenever $0 < \left|x - c\right| < \delta$.

$$\lim_{x \to 10} (10 - 5x)$$

4. (25 POINTS, 5 POINTS EACH) Find the exact **FINITE LIMIT** analytically. If there is no finite limit, write DNE (does not exist). DO NOT USE YOUR CALCULATOR!

a. $\lim_{x \to \pi} \left(\sec^3(9x/4)\right)$

b. $\lim_{x \to 4} \left(\dfrac{x^2 - x - 1}{x - 1}\right)$

c. $\lim_{x \to 0} \dfrac{1 - \cos 3x}{x}$

d. $\lim_{x \to 1/3} \dfrac{3x - 1}{27x^3 - 1}$

e. $\lim_{x \to -32} \left(-\sqrt[5]{x} + \sqrt[3]{2x}\right)$

5. (16 POINTS, 8 POINTS EACH) Find the exact **FINITE LIMIT** analytically. If there is no finite limit, write DNE (does not exist). DO NOT USE YOUR CALCULATOR!

a. $\lim_{x\to 2} \dfrac{\sqrt{x}-\sqrt{2}}{x-2}$

b. $\lim_{\Delta x\to 0} \dfrac{\dfrac{1}{x+\Delta x}-\dfrac{1}{x}}{\Delta x}$

6. (10 POINTS) Use the limit definition to find the derivative of f with respect to x of $f(x) = \sin(x)$.

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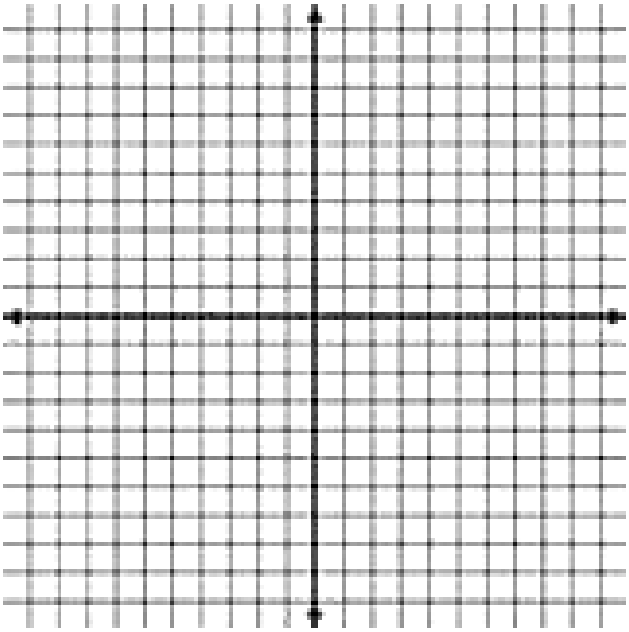
7. (7 POINTS) Find the limit. It is acceptable to write a result of plus or minus infinity.

$$\lim_{x \to \pi/2^+} \sec x$$

8. (10 POINTS) Consider the function

$$f(x)=\begin{cases} x^2-15, & \text{if } x<5 \\ -10, & \text{if } x=5 \\ \sqrt{x-1}, & \text{if } x>5 \end{cases}$$

a) (4 POINTS) Sketch the graph.



b) (3 POINTS) Identify the values of *c*, for which $\lim_{x\to c} f(x)$ exists. Use interval notation.

c) (3 POINTS) On what interval(s) is this function continuous? Use interval notation.

9. (12 POINTS, 3 POINTS EACH). Evaluate the limits below using the following information:

$$\lim_{x\to c} f(x)=\infty,\ \lim_{x\to c} g(x)=\frac{1}{2},\ \text{and}\ \lim_{x\to c} h(x)=5$$

a. $\lim_{x\to c}\left[\frac{h(x)}{f(x)}\right]$

b. $\lim_{x\to c}\left[g(x)\,f(x)\right]$

c. $\lim_{x\to c}\left(-g(x)+\left[h(x)\right]^2\right)$

d. $\cos^{-1}\left(\lim_{x\to c} g(x)\right)$