MATH 150/GRACEY NAME_____

EXAM 1/CHAPTER 1

100 POINTS POSSIBLE

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

NO CALCULATORS!!!

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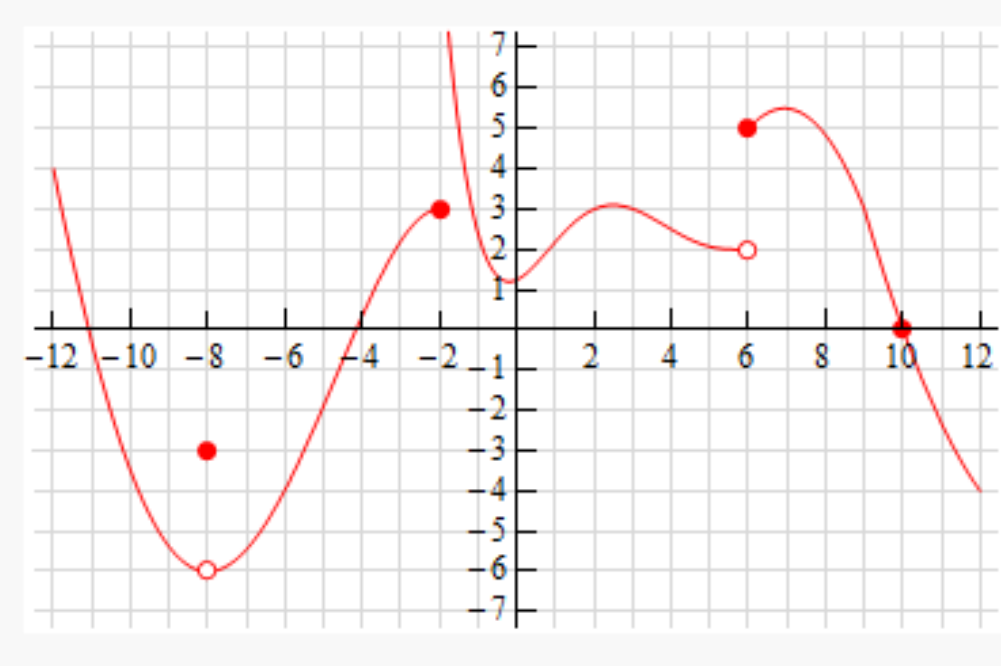
1. (8 POINTS, 2 POINTS EACH) Use the graph of $y = f(x)$ shown below to find each limit, if it exists. If the limit does not exist, explain why.



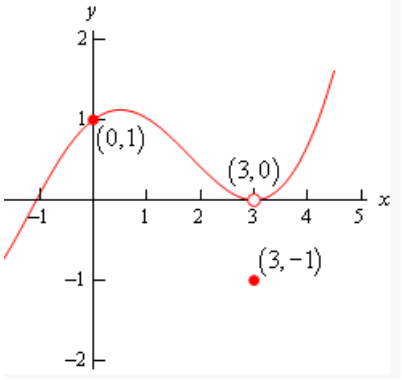
a. $\lim_{x \to -8} f(x)$

c. $\lim_{x \to 6^+} f(x)$

b. $\lim_{x \to 6^-} f(x)$

d. $\lim_{x \to 6} f(x)$

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



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

$$\lim_{x \to 2} \left(4 - \frac{x}{2}\right)$$

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. $\lim_{x \to \pi} \left(\sin \frac{7x}{3}\right)$

b. $\lim_{x \to 7\pi/4} \csc x$

c. $\lim_{x \to 0} \frac{\tan^2 x}{x}$

d. $\lim_{x \to 1} \frac{x - 1}{x^3 - 1}$

e. $\lim_{x \to 400} \left(5x - \sqrt{x}\right)$

5. (12 POINTS, 7 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. $\lim_{x\to 3} \dfrac{\sqrt{x+1}-2}{x-3}$

b. $\lim_{\Delta x\to 0} \dfrac{(x+\Delta x)^2 - x^2}{\Delta x}$

6. (8 POINTS) Find the vertical asymptote(s) of the function $f(x) = \tan 2x$ on $(-\infty, \infty)$.

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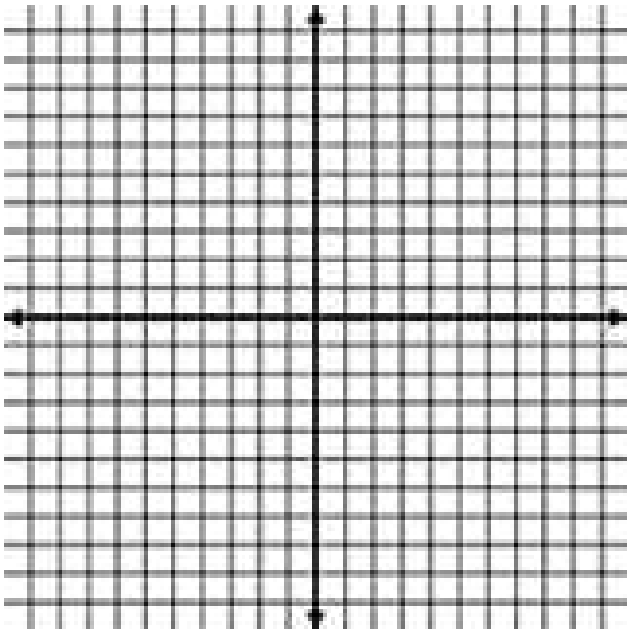
7. (10 POINTS) Consider the function

$$f(x) = \begin{cases} -x^3, & \text{if } x < 2, \\ 7, & \text{if } x = 2, \\ -2, & \text{if } 2 < x < 4 \\ \sqrt{x}, & \text{if } x \geq 4 \end{cases}$$

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.

8. (10 POINTS, 5 POINTS EACH) Find the limit. It is acceptable to write a result of plus or minus infinity. Show work by making a table of values or sketching the graph that corresponds to the limit.

a. $\lim_{x\to\pi^+} \cot x$

b. $\lim_{x\to 2^+} \dfrac{x}{x^2-4}$

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

$$\lim_{x\to c} f(x) = \infty,\ \lim_{x\to c} g(x) = -\frac{1}{\sqrt{2}},\ \text{and}\ \lim_{x\to c} h(x) = -3$$

a. $\lim_{x\to c}\left[\dfrac{g(x)}{2f(x)}\right]^2$

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