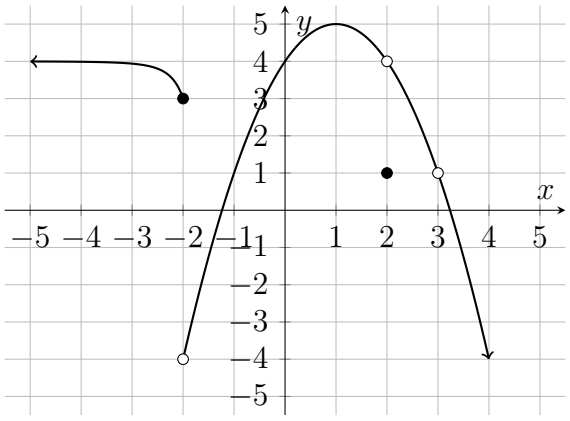
Math 131 Test 1

Name: _____

Show all work/rationale. **No notes, internet, calculators, or any other outside resources allowed**.

1. Given the graph of $f(x)$ below answer the following questions:



   a. (3 points) Find $\lim_{x \to -2^+} f(x)$.

   b. (3 points) Find $\lim_{x \to -2^-} f(x)$.

   c. (3 points) Find $\lim_{x \to 2} f(x)$.

   d. (3 points) At what x-value(s) does $\lim_{x \to a} f(x)$ exist yet $f(a)$ is undefined?

2. (6 points) Simplify completely: $\dfrac{\cos x \tan x}{\sin x}$.

3. Find the limit. Show work or explain your rationale.

a. (6 points) $\lim_{x \to 1} \dfrac{x^2 - x}{2x^2 + 3x - 5}$

b. (6 points) $\lim_{x \to 4^-} \dfrac{x - 7}{x - 4}$

c. (6 points) $\lim_{x \to 4} f(x)$ given $f(x) = \begin{cases} \sqrt{x} + 14 & \text{if } x > 4 \\ -x^2 & \text{if } x \leq 4 \end{cases}$ (use proper notation to receive full credit)

d. (6 points) $\lim_{x \to 1} \dfrac{x - 1}{x^2 - x + 10}$

e. (6 points) $\lim_{x \to 0^+} \ln(\sin x)$

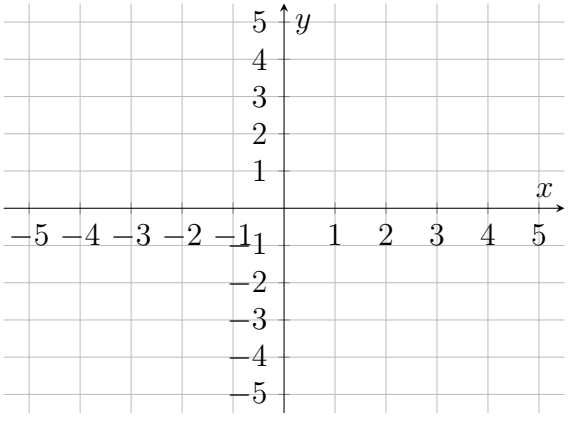
4. (6 points) Graph one period of $f(x) = \sin x$. Label the x and y coordinates of each maximum and minimum y-value as well as the x-intercept(s).

5. (8 points) Sketch one graph of a function $f(x)$ with the following characteristics:

   a. $\lim_{x \to 3^-} f(x) = \infty$ and $\lim_{x \to 3^+} f(x) = -\infty$

   b. $\lim_{x \to 0^-} f(x)$ and $\lim_{x \to 0^+} f(x)$ both exist but $\lim_{x \to 0} f(x)$ does not exist

   c. $\lim_{x \to -3} f(x) = 0$



6. Find the exact value.

   a. (5 points) $\csc\left(\frac{\pi}{2}\right)$

   b. (5 points) $\cot\left(\frac{\pi}{4}\right)$

   c. (5 points) $\cos\left(\frac{4\pi}{3}\right)$

7. (6 points) Use the Squeeze Theorem to show that $\lim_{x\to 0} x^4 \cos\left(\frac{10}{x}\right) = 0$. Use proper notation to receive full credit.

8. (6 points) At what x-value(s) does $f(x) = \dfrac{x-2}{x^2-4}$ have a vertical asymptote? Explain your answer in one or 2 complete sentences.

9. (6 points) If $-x^2 < f(x) < x^2 + 1$, do I have enough information to find $\lim_{x \to 0} f(x)$ using the squeeze theorem? Explain using complete sentences.

10. (5 points) Use the graph below to explain in 2 or 3 complete sentences whether $\lim_{x \to 0} \sin\left(\dfrac{1}{x}\right)$ exists or does not exist. If it does exist, what is $\lim_{x \to 0} \sin\left(\dfrac{1}{x}\right)$?