

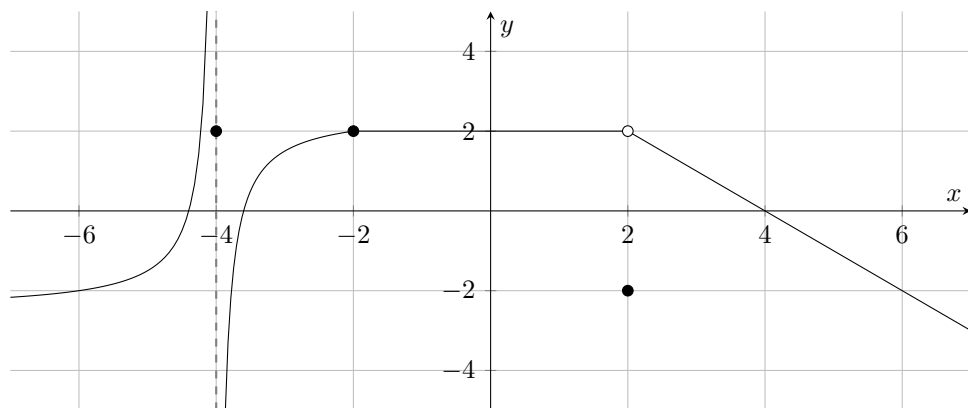
Name:_____ Instructor:_____

Signature:_____ Wildcat ID:_____

Math 220
Exam 1
June 20, 2019

No books, calculators, or notes are allowed. Please make sure your cell phone is turned off. You will have 75 minutes to complete the exam.

Problem	Points	Points Possible
1		12
2		10
3		10
4		6
5		20
6		10
7		12
8		8
9		12
Total Score		100



1. (2 points each) Consider the graph of $y = f(x)$ above. State the value of each of the quantities below. If the limit does not exist or is infinite, write “does not exist,” $+\infty$, or $-\infty$ whenever appropriate. You do not need to show any work.

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

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

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

(d) $f(-4) =$

(e) List all removable discontinuities of $f(x)$: $x =$

(f) List all infinite discontinuities of $f(x)$: $x =$

2. (5 points each) An object moves along a straight line with position $s(t)$ meters at time t seconds. Given the table of data below, answer the following questions. Show all work.

t	$s(t)$
0	0
1	3
1.1	3.3
2	6
3	9

- (a) Find the average velocity of the object over the time interval $1 \leq t \leq 3$ seconds.

- (b) Give the best estimate of the instantaneous velocity of the object at time $t = 1$ second, based on the given data.

3. (5 points each)

- (a) Let $f(x) = x^4 + 2x - 1$. Use the Intermediate Value Theorem to show that there is a point c between -1 and 1 such that $f(c) = 0$. Give a careful explanation to receive full credit.

- (b) Use the Intermediate Value Theorem to show that the equation $2 \sin x = \cos 4x$ has a solution on the interval $[0, \pi/4]$. Give a careful explanation to receive full credit.

4. (6 points) Verify that $\lim_{x \rightarrow 1} (2x - 3) = -1$ using the limit definition.

5. (5 points each) Evaluate the following limits. Write ∞ or $-\infty$ for infinite limits and “does not exist” for limits that do not exist. Show all work.

(a) $\lim_{x \rightarrow 3} \frac{x^2 + x - 12}{x^2 - x - 6}$

(b) $\lim_{t \rightarrow 2^+} \frac{2t + 8}{t^2 - 4}$

(c) $\lim_{x \rightarrow 7} \frac{\sqrt{x - 3} - 2}{x - 7}$

(d) $\lim_{x \rightarrow 1} \frac{3x^3 + 3x + 3}{x^3 + 1}$

6. (10 points) Draw the graph of a function $f(x)$ with the following properties.

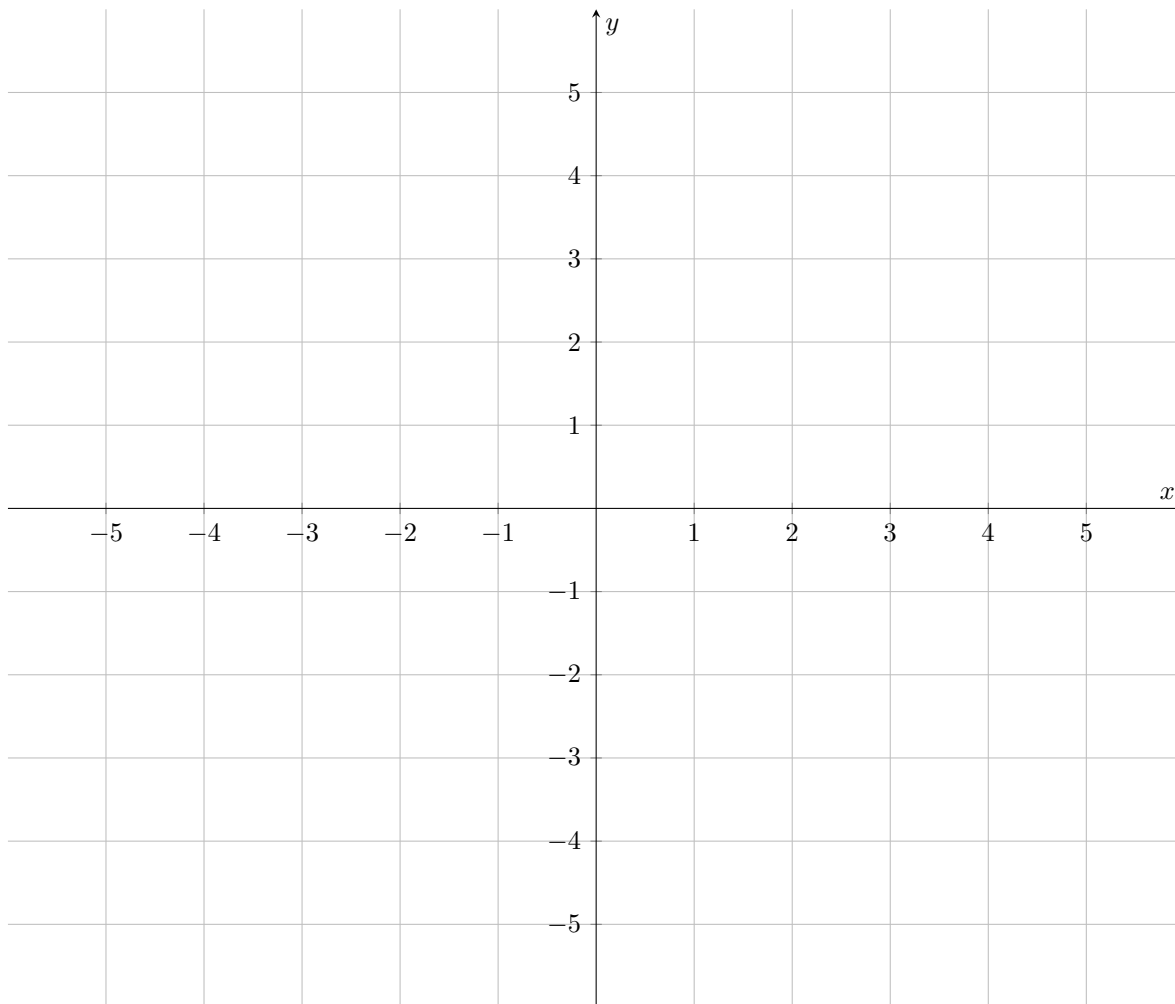
(i) The domain of $f(x)$ is $[-5, 5]$.

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

(iii) $f(0) = 1$

(iv) $f(x)$ is left continuous but not continuous at $x = 2$

(v) $\lim_{x \rightarrow 3^+} f(x) = 2$.



7. (4 points each) Find all of the horizontal asymptotes of each of the following functions. If the function has no horizontal asymptotes, write “no horizontal asymptotes.”

(a) $g(x) = \frac{4x^4 + 2x^2 - x + 1}{-x^4 + x + 8}$

horizontal asymptotes: $y =$

(b) $h(x) = \frac{3x^3 - x^2 + 2x - 1}{x^2 - 2}$

horizontal asymptotes: $y =$

(c) $f(x) = e^{-x}$

horizontal asymptotes: $y =$

8. (8 points) Use the Squeeze Theorem to evaluate $\lim_{x \rightarrow 0} x^2 \sin\left(\frac{1}{x}\right)$. Write ∞ or $-\infty$ for infinite limits and “does not exist” for limits that do not exist. Show all work.

9. (6 points each) Determine each of the following limits. Write ∞ or $-\infty$ for infinite limits and “does not exist” for limits that do not exist. Show all work.

(a) $\lim_{h \rightarrow 0} \frac{3h}{\sin(h)}$

(b) $\lim_{\theta \rightarrow 0} \frac{\cos \theta - \cos^2 \theta}{\theta}$