Name:_____

Student ID:_____

Section:_____

Instructor:_____

Math 131 (Principles of Calculus)
Exam 1A

RED

Instructions:

- For questions which require a written answer, show all your work. Full credit will be given only if the necessary work is shown justifying your answer.
- Simplify your answers.
- Calculators are allowed.
- Should you have need for more space than is allocated to answer a question, use the back of the exam.
- Please do not talk about the test with other students until exams are handed back.

For Instructor use only.

#	Possible	Earned
MC	50	
11	12	
12	10	
13	8	
Sub	80	

#	Possible	Earned
14	10	
15	10	
16	11	
Sub	31	
Total	111	

Part I: Multiple Choice (5 points each) *Mark the correct answer on the bubble sheet.* For questions 1-4, use the following graph of $f(x)$:

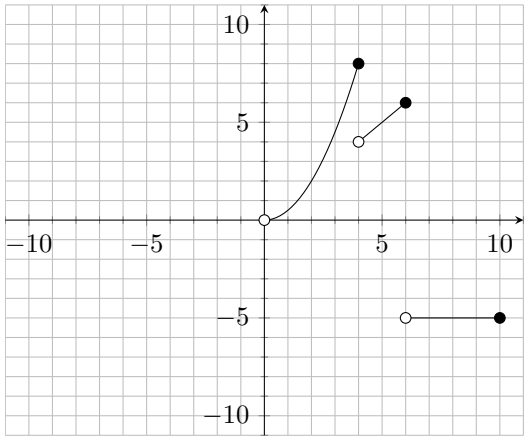

Figure 1: $f(x)$

1. According to the graph of $f(x)$, the $\lim_{x\to 4^+} f(x)$ equals which of the following.

   a) 8 b) 4 c) 0

   d) -3 e) The limit does not exist.

2. According to the graph of $f(x)$, the $\lim_{x\to 10^-} f(x)$ equals which of the following.

   a) $+\infty$ b) 0 c) -2

   d) -4 e) The limit does not exist.

3. According to the graph of $f(x)$, the $\lim_{x\to 2} f(x)$ equals which of the following.

   a) 2 b) 0 c) -3

   d) -4 e) The limit does not exist.

4. According to the graph of $f(x)$, the function $f(x)$ is not continuous at $x = 6$ because

   a) $f(x)$ is not defined at $x = 6$. b) $\lim_{x\to 6} f(x) \neq f(6)$. c) $\lim_{x\to 6} f(x)$ does not exist.

   d) $\lim_{x\to 6^-} f(x) \neq \lim_{x\to 6^+} f(x)$. e) there is a vertical asymptote at $x = 6$.

5. The graph of $g(x)$ is given below.

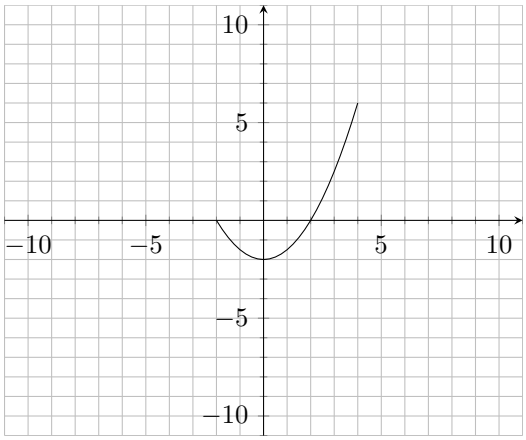

Figure 2: $g(x)$

According to the graph above, the domain and range of $g(x)$ are

a) Domain: $[-2, 6]$, Range: $[-4, 2]$

b) Domain: $[-2, 4]$, Range: $[-2, 6]$

c) Domain: $[-6, 8]$, Range: $[-2, 6]$

d) Domain: $[-12, 12]$, Range: $[-8, 8]$

e) Domain: $[-2, -6]$, Range: $[-2, 4]$

6. Jane notices that football game attendance is higher when the weather is warmer. She finds that 90,000 fans attended a game when the temperature was 75° F and that 60,000 fans attended when the temperature was 45° F. Make a linear model that describes Jane's findings, where t is the temperature in degrees Fahrenheit and $F(t)$ is the number of fans attending a game.

a) $F(t) = 1000t + 15,000$

b) $F(t) = 1000t - 30,000$

c) $F(t) = 500t + 40,000$

d) $F(t) = 500t - 60,000$

e) none of these

7. The Mitten Crab is an invasive species in Washington State. Suppose there were 8 crabs introduced into Mason Lake in 2000 and that they multiply by a factor of 5 every 3 years. Approximately how many crabs would there be in the lake in 2020?

a) 1526

b) 365,502

c) 3125

d) 244,140,625,000

e) 25,124

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8. Given a function $f(x)$, then the graph of $-4f(x-4)$ will be

   a) the graph of $f(x)$ shrunk horizontally by a factor of 4, shifted 4 units up and reflected horizontally.

   b) the graph of $f(x)$ stretched vertically by a factor of 4, shifted 4 units up and reflected horizontally.

   c) the graph of $f(x)$ stretched vertically by a factor of 4, shifted 4 units to the right and reflected vertically.

   d) the graph of $f(x)$ stretched horizontally by a factor of 4, shifted 4 units to the left and reflected vertically.

   e) the graph of $f(x)$ shrunk vertically by a factor of 4, shifted 4 units to the right.

9. Find the domain of $f(x) = \dfrac{x}{x^2-4}$.

   a) $(-2,2) \cup (2,\infty)$

   b) $(-\infty,-4) \cup (-4,4) \cup (4,\infty)$

   c) $(-\infty,-4) \cup (0,\infty)$

   d) $(-\infty,-2) \cup (-2,2) \cup (2,\infty)$

   e) $[-2,2)$

10. Let $f(x) = \sqrt{9-x^2}$ and $g(x) = \sqrt{1+x}$. What is the domain of $f(x)+g(x)$?

    a) $[-3,3]$

    b) $[-1,3]$

    c) $[-3,\infty]$

    d) $[-1,\infty]$

    e) $[-3,1]$

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Part III: Free Response *Show all work*

11. (12 points) Let $f(x) = x^2 - 1$ and $g(x) = x + 3$.

    a.) (2 points) Calculate the domain of $\dfrac{g(x)}{f(x)}$.

    b.) (10 points) Calculate and simplify $h(x) = \dfrac{f(g(x)) - f(3)}{x}$.

12. (10 points) Evaluate the limit algebraically (show all your work!)

$$\lim_{x \to 3} \frac{\sqrt{x^2 + 16} - 5}{x - 3}.$$

13. (8 points) For the function

$$f(x) = \frac{x^2 - 4x + 3}{x^2 + 3x + 2},$$

a.) (4 points) Find the vertical asymptotes of $f(x)$.

b.) (4 points) Find the limit $\lim_{x\to\infty} f(x)$.

14. (10 points) Evaluate each limit as a number, ∞, or $-\infty$.

a) $\lim_{x\to\infty} \dfrac{6x^5 + 3x^2}{2x^5 - 3x}$

b) $\lim_{x\to\infty} \dfrac{3x^4 - 2x^2}{x^3 + 1}$

c) $\lim_{x\to-\infty} \dfrac{3x^4 - 2x^2}{x^5 + 2}$

d) $\lim_{x\to-\infty} \dfrac{7e^x - x^2}{9e^x - x^7}$

e) $\lim_{x\to-\infty} \dfrac{x^3 - x^2}{2x^3 - x}$

15. (10 points) Find $f^{-1}(x)$ for the following function,

$$f(x) = \frac{e^{5x+1}}{e^{2x-3}} - 3.$$

16. (11 points) Natalie believes that football teams that throw long passes tend to perform better. She collects data on five football teams describing the longest pass the team throws during the season and the average number of points their football teams scored in a season. The data is given in the table below. Natalie wishes to construct a linear model representing this data set.

Longest Pass (yds)	Average Points
25	8.8
35	11.6
55	26.1
60	26.8
70	32.7

a.) (5 points) Find a linear model for this data set by **using the first and last points** in the table.

b.) (3 points) Natalie enters the points into her calculator and computes that the linear regression line for her data is $P(x) = y = 0.558x - 6.1434$, where x is the length of the longest pass a team throws and $P(x)$ is the average number of points scored per game. Use her linear model to predict the average number of points a team would score whose longest pass is 45 yards.

c.) (3 points) Use her model to predict the average number of points a team would score whose longest pass is 5 yards. Is this a realistic prediction? Why or why not?

END OF EXAM