STUDENT NAME: _____

INSTRUCTOR: _____

Please sign the pledge:
On my honor as a student, I have neither given nor received aid on this exam.

Directions

Answer each question in the space provided. Please write clearly and legibly. Show all of your work in order to receive full credit, and clearly identify your final answer. No books, notes or calculators are allowed.

For instructor use only

Page	Points	Score
2	10	
3	11	
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5	17	
6	17	
7	17	
8	18	
Total:	100	

1. [4 pts] **If the line passing through the points (a, 1) and (2, 4) is parallel to the line passing through the points (2, a) and (4, 1), what are all possible values of a?**

ANSWER:

2. [6 pts] Find the domain of the function and write it as unions of intervals

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

ANSWER:

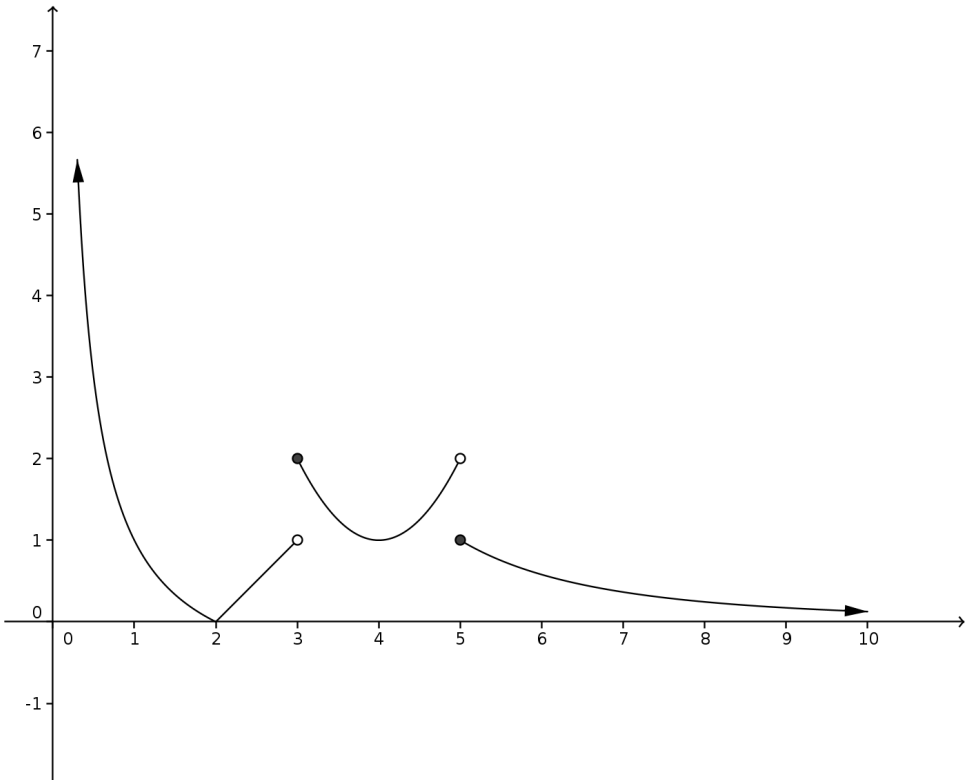
3. Evaluate the following limits or write DNE if the limit does not exist (please justify your answers):

(a) [3 pts] $\lim_{x\to -1} \dfrac{x^2 - x + 2}{x + 3}$ **ANSWER**:

(b) [4 pts] $\lim_{x\to -\infty} \dfrac{12x^4 - 2x^2 + 1}{-5x^4 - 30x + 5}$ **ANSWER**:

(c) [4 pts] $\lim_{x\to 3} \dfrac{|2x - 6|}{x - 3}$ **ANSWER**:

4. Consider the following graph of a function $f(x)$:



(a) [3 pts] What is the domain and range of $f(x)$?

(b) [2 pts] Find the points in the domain where the function is discontinuous.

(c) [2 pts] For which values of x in the domain of $f(x)$ is $f(x)$ non-differentiable?

(d) [3 pts] Evaluate the limits or explain why it doesn't exist:
$\lim_{x\to 2} f(x)$, $\lim_{x\to 5} f(x)$, $\lim_{x\to\infty} f(x)$

5. Compute the derivative of each of the following functions. **Do not simplify your answer. Box your final answer.**

   (a) [5 pts] $f(x) = (x^3 + 2x - 1)(4x^5 + 3x^2 + 6)$

   (b) [6 pts] $g(x) = \dfrac{\sqrt{3 - 2x}}{x^2 - x}$

   (c) [6 pts] $h(x) = (2x^3 + 3x - 1)^{\frac{1}{3}}$

6. [9 pts] Use the **limit definition of the derivative** to compute the derivative of $f(x) = \sqrt{x}$.

7. [8 pts] For $f(x) = \begin{cases} 5x - 1 & \text{if } x < 1 \\ k & \text{if } x = 1 \\ x^2 + 3 & \text{if } x > 1 \end{cases}$, determine the value of k, if any, that makes the function continuous at $x = 1$. Justify your answer.

8. [10 pts] A car leaves the garage at time $t = 0$ and moves in a straignt line. Suppose the distance $d(t)$ between the car and the garage is given by $d(t) = 5t^4 + 3t^2$, then find both the velocity and acceleration of the car at time $t = 2$.

   ANSWER:

9. [7 pts] Suppose $f(x)$ and $g(x)$ are differentiable functions with the following information: $f(1) = 4$, $g(1) = 2$, $f'(1) = 1$, $g'(1) = 5$, $f'(-2) = 3$, $g'(-2) = 10$
   Please find the value of $h'(1)$ where $h(x) = f(g(x) - f(x))$

   ANSWER:

10. [7 pts] Does the function $f(x) = x^3 - 5x + 1$ have a root (zero) on the interval $[-1, 1]$? Explain why or why not.

11. Given the funtion $f(x) = 5x^3 + 3x^2 + 2$

    (a) [6 pts] Find the line tangent to $f(x)$ at $x = 1$.

    ANSWER:

    (b) [5 pts] Find all values of x that make the slope of the tangent line to $f(x)$ equal to 9.

    ANSWER: