Name _____

Date: October 23, 2024 Professor: Asher Roberts

Calculus I Test 2

Derivatives
Number of questions—10

Directions: Solve each of the following problems, using the available space to show all relevant work. Irrelevant work will detract from your score, while answers without work shown will be awarded no credit. Answers with partially correct work will receive partial credit. Each problem is worth 10 points. You must work alone, but you may use a graphing calculator as a supplement to your own work if you indicate the steps used. You may not use computational intelligence or AI.

In this exam:

(1) Unless otherwise specified, the domain of a function f is assumed to be the set of all real numbers x for which $f(x)$ is a real number.

(2) The inverse of a trigonometric function f may be indicated using the inverse function notation f^{-1} or with the prefix "arc" (e.g., $\sin^{-1} x = \arcsin x$).

(for teacher use only)

Exam Score			
Question	**Points**	**Question**	**Points**
1		6	
2		7	
3		8	
4		9	
5		10	
Overall Score:			

1. Let $H(t)$ be the daily cost (in dollars) to heat St. Angela Hall when the outside temperature is t degrees Fahrenheit. What is the meaning of $H'(58)$? What are its units?

2. Find $\dfrac{dy}{dx}$ if $y = 2x^{99} - 3x^{79} + 4x^{59} - x^{39} + x^{19} - 11$.

3. Find $f'(x)$ if $f(x) = 3\sqrt[5]{x^2} + 2\sqrt{x^3} + \dfrac{8}{x^6} - \dfrac{4}{x^7}$.

4. Let $h(x) = -4f(x) + 8g(x) - 3$. Use the table below to find $h'(2)$.

x	$f(x)$	$g(x)$	$f'(x)$	$g'(x)$
2	9	3	-4	2

5. Write an equation of the line tangent to the graph of $f(x) = 3x^6 - 2x^5 + x^3 - 1$ at the point where $x = 2$.

6. Use the table below to find the average rate of change of f from $x = 3$ to $x = 6$ and the instantaneous rate of change of f at $x = 3$.

x	0	3	6	9	12
$f(x)$	4	2	4	1	-6
$f'(x)$	-1	1	-1	-2	-3

7. A particle's position after t minutes is given by the equation $s = 2t^4 + 5t^3 - 8t + 50$ where s is in meters. Find the particle's acceleration after 3 minutes.

8. Differentiate $y = \left(2\sqrt{x} - \dfrac{4}{\sqrt{x}}\right) e^x$.

9. Differentiate $y = \dfrac{4x^{\pi}}{6e^{x}}$.

10. Find $\lim_{h \to 0} \dfrac{8\left(\dfrac{1}{2} + h\right)^8 - \dfrac{1}{32}}{h}$.