Quiz – Rolles' Theorem, MVT,
First and Second Derivative Test
Calculus AB **10 pts each**

Name ______________________________
Date ______________________________ **Per**____

1. Use the first derivative test to name the largest open intervals where the function $g(x) = 2x^3 - 3x^2 - 36x - 2$ is decreasing or increasing. Name the x values all relative extrema.

2. Find the largest open intervals where $f(x) = -3x^4 - 8x^3$ function is concave up or concave down. Name any points of inflection.

3. Find all values of c where the Mean Value Theorem applies to the equation $y = x^2 - 6x + 1$ on the interval [-1, 2].

4. Perform the **second** derivative test for $f(x) = 3x^4 - 8x^3$. Box your conclusion.

5. What is a critical point? ____

6. Name the 3 criteria that must is exist to apply Rolle's Theorem.

   1. ______________________________
   2. ______________________________
   3. ______________________________

7. Show if Rolles' Theorem applies to $f(x) = (x-2)(x+2)^2$ on the interval $[-2,2]$. Then if possible, find all value(s) of c where Rolles' Theorem applies.

8. Find the ***absolute extrema*** $f(x) = 2x - 3x^{\frac{2}{3}}$ on [-1,8]

Find the critical points of each. Box your answers!

9. $f(x) = 3x - 9x^{\frac{2}{3}}$

10. $h(x) = \dfrac{x^2+1}{x^2-4}$

Quiz – Rolles' Theorem, MVT, **Name** ______________________

First and Second Derivative Test **Date** ______________________ **Per**____

Calculus AB **10 pts each**

1. Use the first derivative test to name the largest open intervals where the function $g(x)=2x^3-3x^2-36x-2$ is decreasing or increasing. Name the x values all relative extrema.

$g' = 6x^2 - 6x - 36 = 0$

$x^2 - x - 6 = 0$

$(x-3)(x+2) = 0$

$3, -2$

	-2		3	
f'	$+$	$-$		$+$
f	↗	↘		↗

$\boxed{\text{REL MAX @ } x=-2 \quad \text{REL MIN @ } x=3}$

$\boxed{\text{INC: } (-\infty,-2),\ (3,\infty) \quad \text{DEC: } (-2,3)}$

2. Find the largest open intervals where $f(x)=-3x^4-8x^3$ function is concave up or concave down. Name any points of inflection.

$f' = -12x^3 - 24x^2$

$f'' = -36x^2 - 48x = 0$

$-12x(3x+4)$

$0 \qquad -4/3$

	$-4/3$		0	
f''	$-$	$+$		$-$
f	CC↓	CC↑		CC↓

$\boxed{\text{POI @ } x = -4/3,\ 0}$

$\boxed{\text{CC}\uparrow: (-4/3, 0) \quad \text{CC}\downarrow: (-\infty, -\tfrac{4}{3})(0,\infty)}$

3. Find all values of c where the Mean Value Theorem applies to the equation $y=x^2-6x+1$ on the interval [-1, 2].

$y = x^2 - 6x + 1$

$y' = 2x - 6$

$\frac{y(2)-y(-1)}{2--1} = \frac{-7-8}{3} = -5$

$y(2) = 4 - 12 + 1 = -7$

$y(-1) = 1 + 6 + 1 = 8$

$2x - 6 = -5$

$2x = 1$

$\boxed{x = 1/2}$

4. Perform the **second** derivative test for $f(x)=3x^4-8x^3$. Box your conclusion.

$f' = 12x^3 - 24x^2$

$12x^2(x-2)$

$0 \qquad 2$

$f''(x) = 36x^2 - 48x$

$12x(3x-4)$

$\boxed{f''(0) = 0 \text{ TEST FAILS} \quad f''(2) = \text{Pos} \ \text{REL MIN @ } x=2}$

5. What is a critical point? VALUES OF X WHERE f' IS ZERO OR UNDEFINED

6. Name the 3 criteria that must is exist to apply Rolle's Theorem.

1. CONTINUOUS
2. DIFFERENTIABLE
3. SAME y VALUES (f(b) = f(a))

7. Show if Rolles' Theorem applies to $f(x)=(x-2)(x+2)^2$ on the interval $[-2,2]$. Then if possible, find all value(s) of c where Rolles' Theorem applies.

$\boxed{\begin{array}{l} f(2)=0 \\ f(-2)=0 \end{array}}$

$f' =$

$(1)(x+2)^2 + (x-2)(2)(x+2)'(1)$

$(x+2)[x+2+2(x-2)]$

$(x+2)[3x-2]$

$-2 \quad +2/3$

$+2/3$

8. Find the ***absolute extrema*** $f(x)=2x-3x^{\frac{2}{3}}$ on [-1,8]

$f' = 2-2x^{-1/3}$

$2-\frac{2}{x^{1/3}}$

$2=\frac{2}{x^{1/3}}$

$2x^{1/3}=2$

$x^{1/3}=2$

$x=1$

$f(-1) = -2-3(1) = -5$ ABS MIN!

$f(0)=0$

$f(1)=-1$

$f(8)=16-3(4)=4$ ABSOLUTE MAX!

Find the critical points of each. Box your answers!

9. $f(x)=3x-9x^{\frac{2}{3}}$

$f' = 3-6x^{-1/3}=0$

$3-\frac{6}{x^{1/3}}=0$

$3=\frac{6}{x^{1/3}}$

$x^{1/3}=2$

$x=8$

$\boxed{\text{cp}: 0, 8}$

10. $h(x)=\frac{x^2+1}{x^2-4}$

$h'(x)=\frac{(x^2-4)(2x)-(x^2+1)(2x)}{(x^2-4)^2}$

$h'(x)=\frac{2x^3-8x-2x^3-2x}{(x^2-4)^2}$

$h'(x)=\frac{-10x}{(x^2-4)^2}$

$\boxed{0, \pm 2}$