Calculus I
UNIT 4: Applications of Derivatives – QUIZ #2 REVIEW

Name: _____
Date: _____

STUDY GUIDE

INCREASING / DECREASING INTERVALS: Use 1st Derivative

1.) Find $f'(x)$
2.) Find critical numbers for $f'(x)$
3.) Place the critical numbers on a number line and pick test values on each interval
4.) Replace these test values in $f'(x)$ to determine " $+$ " or " $-$ "
   - " $+$ " $\rightarrow$ Increasing
   - " $-$ " $\rightarrow$ Decreasing
5.) Write your results using interval notation

LOCAL MAXIMUM / LOCAL MINIMUM:

- Use First Derivative Test
- These are found when a function changes from [no VA]:
   - Increasing to decreasing Local Maximum
   - Decreasing to increasing Local Minimum
- Be sure to write in point form!!!

INTERVALS OF CONCAVITY: Use 2nd Derivative

1.) Find $f''(x)$
2.) Find critical points for $f''(x)$
3.) Place critical points on a number line and pick test values on each interval
4.) Replace these test values in $f''(x)$ to determine " $+$ " or " $-$ "
   - " $+$ " $\rightarrow$ Concave UP
   - " $-$ " $\rightarrow$ Concave DOWN
5.) Write your results using interval notation

POINTS OF INFLECTION:

- These are found when a continuous function changes from [no VA]:
   - Concave up to concave down
   - Concave down to concave up
- Be sure to write in point form!!!

REVIEW

1.) Find the intervals where the function is increasing and decreasing. Then use the First Derivative Test to identify the local maximum and local minimum value(s).

$f(x) = x^3 - 75x$

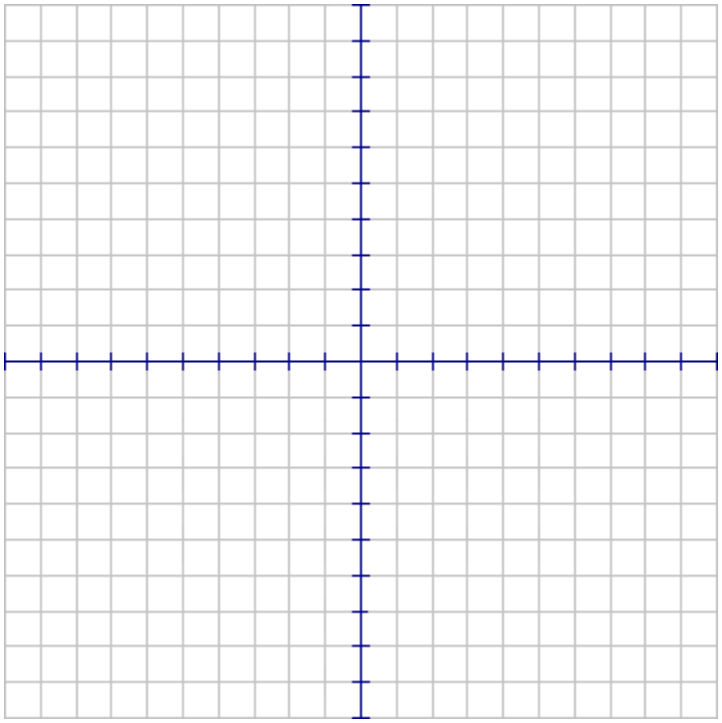
2.) Find the intervals of concavity for the function. Then identify all points of inflection.

$f(x) = x^4 - 4x^3 + 10x - 9$

Directions: Given the function, find all information then sketch a graph.

3.) $f(x) = x^3 - 3x^2 + 4$ $f'(x) =$ _____ $f''(x) =$ _____

DOMAIN	
x-intercept(s)	y-intercept
HOLE(S)	VA's
HA's	SA's
INCREASING	DECREASING
LOCAL MAXIMUM(S)	LOCAL MINIMUM(S)
CONCAVE UP	CONCAVE DOWN
POINT(S) OF INFLECTION	



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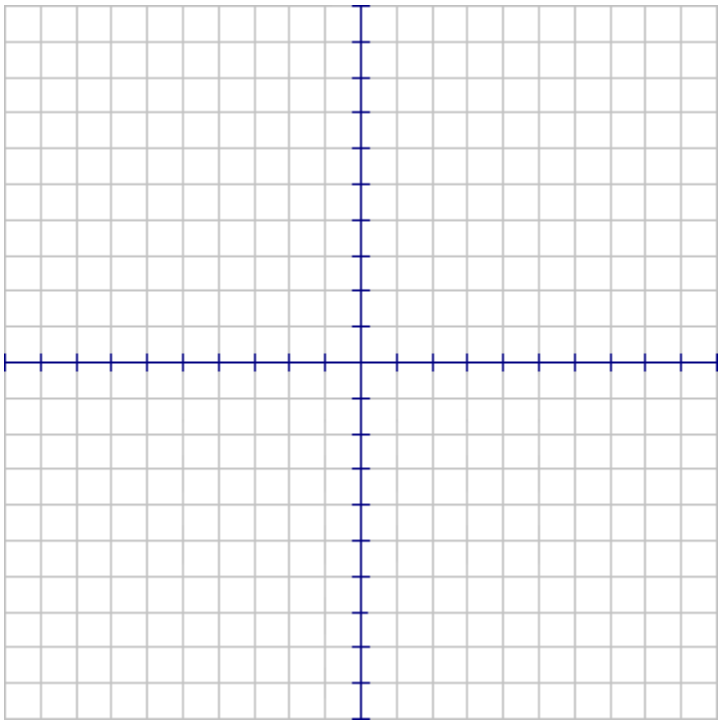
Directions: Given the function, find all information then sketch a graph.

4.) $f(x) = \frac{x^2+1}{x}$ $f'(x) =$ _____ $f''(x) =$ _____

DOMAIN	
x-intercept(s)	y-intercept
HOLE(S)	VA's
HA's	SA's
INCREASING	DECREASING
LOCAL MAXIMUM(S)	LOCAL MINIMUM(S)
CONCAVE UP	CONCAVE DOWN
POINT(S) OF INFLECTION	



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Directions: Determine if the statement is TRUE or FALSE.

_____ 5.) All polynomials are continuous.

_____ 6.) A critical point is a location where change will occur.

_____ 7.) A point of inflection will result in a change in concavity.

_____ 8.) Concavity represents how the slope of a function is changing.

_____ 9.) A change in concavity must occur at a point of inflection.

_____ 10.) The local minimum is the minimum height of the function.

_____ 11.) The local maximum represents a change in the slope of a function from increasing to decreasing.

_____ 12.) Local extrema are the result of a change in slope on a graph.

_____ 13.) Critical points on the second derivative are potential points of inflection.

_____ 14.) Critical points on the first derivative of a polynomial represent where a horizontal tangent exists.

_____ 15.) The maximum height on a graph can be the local maximum.

_____ 16.) A vertical asymptote will always result in a critical point.

_____ 17.) When the first derivative equals zero, it results in local extrema.

_____ 18.) Relative minimum is another name for the local minimum.

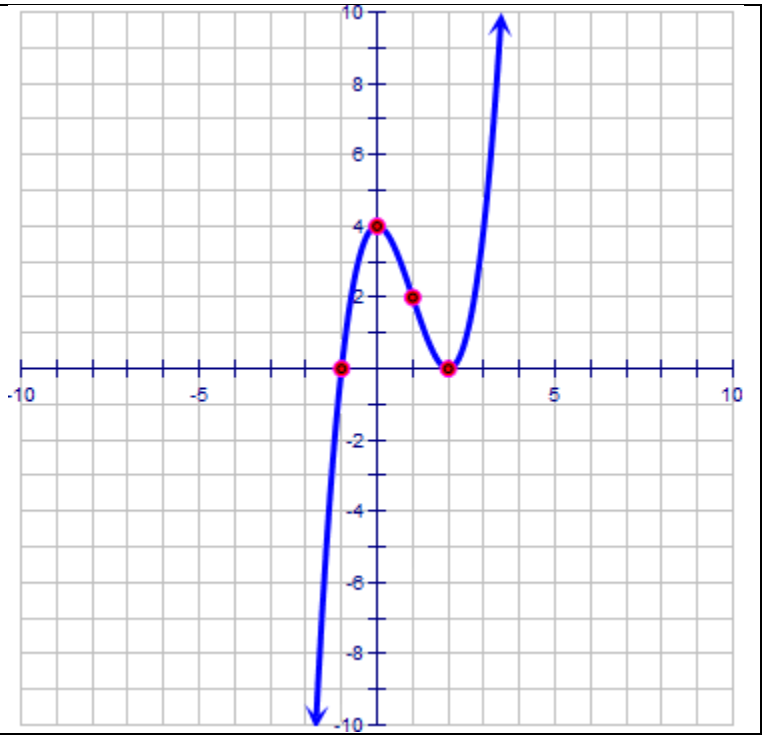
SOLUTIONS

1.) Increasing: $(-\infty, -5) \cup (5, \infty)$
Decreasing: $(-5, 5)$
Local Max: $(-5, 250)$
Local Min: $(5, -250)$

2.) Concave UP: $(-\infty, 0) \cup (2, \infty)$
Concave DOWN: $(0, 2)$
Pts of Inflection: $(0, -9)$ and $(2, -5)$

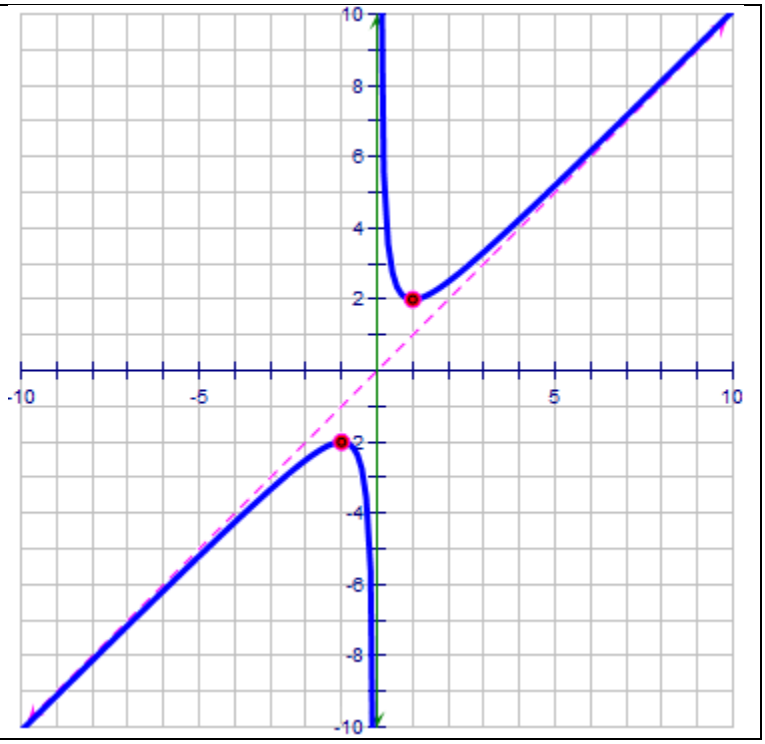
3.) $f(x) = x^3 - 3x^2 + 4$ $\quad f'(x) = 3x^2 - 6x$ $\quad f''(x) = 6x - 6$

DOMAIN	
$(-\infty, \infty)$	
x-intercept(s)	y-intercept
$(-1, 0)$ and $(2, 0)$	$(0, 4)$
HOLE(S)	VA's
none	none
HA's	SA's
none	none
INCREASING	DECREASING
$(-\infty, 0) \cup (2, \infty)$	$(0, 2)$
LOCAL MAXIMUM(S)	LOCAL MINIMUM(S)
$(0, 4)$	$(2, 0)$
CONCAVE UP	CONCAVE DOWN
$(1, \infty)$	$(-\infty, 1)$
POINT(S) OF INFLECTION	
$(1, 2)$	



4.) $f(x) = \frac{x^2+1}{x}$ $\quad f'(x) = \frac{x^2-1}{x}$ $\quad f''(x) = \frac{2}{x^3}$

DOMAIN	
$(-\infty, 0) \cup (0, \infty)$	
x-intercept(s)	y-intercept
none	none
HOLE(S)	VA's
none	$x = 0$
HA's	SA's
none	$y = x$
INCREASING	DECREASING
$(-\infty, -1) \cup (1, \infty)$	$(-1, 0) \cup (0, 1)$
LOCAL MAXIMUM(S)	LOCAL MINIMUM(S)
$(-1, -2)$	$(1, 2)$
CONCAVE UP	CONCAVE DOWN
$(0, \infty)$	$(-\infty, 0)$
POINT(S) OF INFLECTION	
none	



5.) TRUE 6.) FALSE 7.) TRUE 8.) TRUE 9.) FALSE 10.) FALSE 11.) TRUE

12.) FALSE 13.) TRUE 14.) TRUE 15.) TRUE 16.) TRUE 17.) FALSE 18.) TRUE