AP Calc AB Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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 WS Assessment

 Target 12:

Mean value theorem

Extreme value theorem

**I can:**

* Justify conclusion about functions by applying the MVT over in interval
* Justify conclusion about functions by applying the EVT
* Justify conclusion about the behavior of a function base on the behavior of its derivatives

Unit 5: Analytical Applications of Differentiation

HW Target 12

Unit 5 Progress Check MCQ A

**Mean Value Theorem** for Derivative

If y = f(x) is continuous at every point of the closed interval [a, b] and differentiable on the interval (a, b) then there is at least one point c in (a, b) at which $f^{'}\left(c\right)=\frac{f\left(b\right)-f(a)}{b-a}$. In other words, at some points the IROC = AROC;

 (slope of tangent line at c) = (slope of secant line thru the ends a and b)

State the reason why MVT does not apply to f on [1,3] for the following function

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Matching up each function card with an explanation card that correctly determines whether the MVT would apply and why. You may graph it out

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Correct your answers

For each of the following functions described below, determine whether the Mean Value Theorem can be applied on the interval [−3,3]. If it can be applied, explain how you know. If it cannot be applied, explain why not.

Example: f(x) is a function differentiable for all real numbers.

Answer: The MVT can be applied. Since the function is differentiable for all real numbers, it is also continuous for all real numbers. So it is certainly continuous on [−3,3] and differentiable on (−3,3).

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| f (x) is continuous for all real numbers.  |  |
| f(x) is differentiable on (−3,3). |  |
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Base on the MVT-D, find the value of c for the following function

f(x) = x2 on [1, 3] f(x) = x3 – 12 on [-2, 2] f(x) = x2 – x – 12 on [-3, 4]

f(x) = 1/x on [-2, 2] f(x) = 1/x on [-1, 3]

Suppose it took 14 seconds for a thermometer to rise from −19°C to 100°C. Show that sometime between t = 0 and t = 14 (sec) the mercury is rising at the exact rate of 8.5°C/sec.

**Extreme Value Theorem (EVT)** states that if f (x) is continuous on the interval [a, b] then f (x) has both an absolute maximum value and an absolute minimum value on [a, b]. These extreme values occur at either an endpoint or at a critical point within [ a, b].

Recall: A critical point is a value x in the domain of f for which f ′(x) = 0 or

 for which f ′(x) is undefined

Let f (x) = (x2 − 9x) 1/3 on [–4, 8]. Find all critical points. Then find the maximum value and the minimum value of f on the given interval and state where these extreme values occur.

Find the critical points of f (x) = 10x /(4 – x)2 and find the extreme values of f on interval **[3, 6].**

**Increasing and Decreasing Function Behavior**

Given the graph of the derivative function.

State the interval in which the **function** increase / decrease

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| IncreaseDecrease |  |  |

One function is *g* (*x*)whose graph is the **solid curve**. The other function is *h* (*x*) whose graph is the **dashed curve**. One of these functions is the derivative of the other. That is, either *g* (*x*)'= *h* (*x*) or *h* (*x*) ' =*g* (*x*). Decide which of these alternatives is correct and support your assertion with as many specific facts regarding features of the graphs as you can.



Assessment

From the graph of f(x), draw a graph of f ' (x).

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From the graph of f ' (x), draw a graph of f(x)

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When looking at the graph of a function, how can you tell whether the value of that function is positive or negative?

What condition on the derivative of a function would guarantee that the original function is increasing in a given interval?

What condition on the derivative of a function would guarantee that the original function is decreasing in an interval?

