NAME James D DATE ______________

AP Calculus FRQ #26

Tables

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
1	6	4	2	5
2	9	2	3	1
3	10	−4	4	2
4	−1	3	6	7

The functions f and g are differentiable for all real numbers, and g is strictly increasing. The table gives values of the functions and their first derivatives at selected values of x. The function h is given by $h(x) = f(g(x)) - 6$.

(a) Explain why there must be a value r for $1 < r < 3$ such that $h(r) = -5$.

$h(x) = f(g(x)) - 6$

$h(1) = 3$ IVT. Because f and g are cont. h must also be cont.

$h(3) = -7$

By IVT, there must be a value r for $1<r<3$ s.t. $h(r)=-5$ because $-7<-5<3$

(b) Explain why there must be a value c for $1 < c < 3$ such that $h'(c) = -5$.

h is cont. and differentiable. Conditions for MVT are met.

$\frac{h(3)-h(1)}{3-1} = \frac{-7-3}{2} = \boxed{-5}$

∴ By MVT, there exists a value c for $1<c<3$ s.t. $h'(c) = -5$

(c) Let w be the function given by $w(x) = \int_1^{g(x)} f(t)\,dt$. Find the value of $w'(3)$.

$w'(x) = f(g(x)) \cdot g'(x)$

$w'(3) = f(g(3)) \cdot g'(3) = -1 \cdot 2 = \boxed{-2}$

(d) If g^{-1} is the inverse function of g, write an equation for the tangent to the graph of $y = g^{-1}(x)$ at $x = 2$.

$g^{-1\prime}(x) = \frac{1}{g'(g^{-1}(x))}$ $g(1) = 2$

$g^{-1\prime}(2) = \frac{1}{5}$ $g^{-1}(g(1)) = g^{-1}(2)$

$= 1$

$\boxed{y-1 = \frac{1}{5}(x-2)}$

NAME James [illegible] DATE ____________

AP Calculus FRQ #30

Tables

1. The table below shows the behavior of a function f that is continuous for all real numbers. For the function, $f(2) = 4$, and $\lim_{x\to\infty} f(x) = 0$.

	$x < 4$	$X = 4$	$x > 4$
$f'(x)$	Positive	DNE	Negative
$f''(x)$	Negative	DNE	Positive

(a) For what values of x is f increasing? Explain.

$x \in (-\infty, 4)$. $f'(x)$ must be positive

(b) Does f have a relative maximum at $x = 4$? Justify your answer.

Yes. $f'(x) =$ DNE at $x = 4$.

Sign change from positive to neg.

(c) If possible, name the x-coordinate of the point of inflection on the graph of f. Justify your answer.

$x = 4$. f'' changes sign at $x = 4$

(d) Does MVT apply over the interval [3, 5]? Justify your answer.

No. Function must be differentiable. * $f'(x)$ is DNE at $x = 4$.

(e) Sketch a possible graph of f.