AP Calculus **Derivatives of Inverse Functions** HW Name Key

Show all work for each problem.

(1)

x	$f(x)$	$g(x)$	$f'(x)$
–4	0	–9	5
–2	4	–7	4
0	6	–4	2
2	7	–3	1
4	10	–2	3

The table above gives values of the differentiable functions f and g, and f', the derivative of f, at selected values of x. If $g(x) = f^{-1}(x)$, what is the value of $g'(4)$?

(A) $-\frac{1}{3}$ (B) $-\frac{1}{4}$ (C) $-\frac{3}{100}$ (D) $\frac{1}{4}$ (E) $\frac{1}{3}$

$x = 4$ at -2 $\quad g'(4) = \frac{1}{f'(-2)}$

$= \frac{1}{4}$

(2) Let f be the function defined by $f(x) = x^3 + x$. If $g(x) = f^{-1}(x)$ and $g(2) = 1$, what is the value of $g'(2)$?

(A) $\frac{1}{13}$ (B) $\frac{1}{4}$ (C) $\frac{7}{4}$ (D) 4 (E) 13

$g'(2) = \frac{1}{f'(g(2))}$

$g'(2) = \frac{1}{f'(1)}$

$x = 2$ at 1

$f'(x) = 3x^2 + 1$

$f'(1) = 3(1)^2 + 1$

$= 4$

$= \frac{1}{4}$

over →

(3) Let f be a differentiable function such that $f(3) = 15$, $f(6) = 3$, $f'(3) = -8$, and $f'(6) = -2$. The function g is differentiable and $g(x) = f^{-1}(x)$ for all x. What is the value of $g'(3)$?

(A) $-\frac{1}{2}$

(B) $-\frac{1}{8}$

(C) $\frac{1}{6}$

(D) $\frac{1}{3}$

(E) The value of $g'(3)$ cannot be determined from the information given.

$x = 3$ at 6

$$g'(3) = \frac{1}{f'(6)}$$

$$= \frac{1}{-2}$$

(4) The functions f and g are differentiable, and $f(g(x)) = x$ for all x. If $f(3) = 8$ and $f'(3) = 9$, what are the values of $g(8)$ and $g'(8)$?

(A) $g(8) = \frac{1}{3}$ and $g'(8) = -\frac{1}{9}$

(B) $g(8) = \frac{1}{3}$ and $g'(8) = \frac{1}{9}$

(C) $g(8) = 3$ and $g'(8) = -9$

(D) $g(8) = 3$ and $g'(8) = -\frac{1}{9}$

(E) $g(8) = 3$ and $g'(8) = \frac{1}{9}$

$g(8) = 3$

$x = 8$ at 3

$$g'(8) = \frac{1}{f'(3)}$$

$$= \frac{1}{9}$$