DATE: ______________

Derivatives of Inverse Functions

1. The function $f(x) = x^5 + 3x - 2$ passes through the point (1,2). Let f^{-1} denote the inverse of f. Then $(f^{-1})'(2)$ equals:

$f(1) = 2$

(A) $\frac{1}{83}$ **(B)** $\boxed{\frac{1}{8}}$ **(C)** 1 **(D)** 8 **(E)** 83

$f(x) = x^5 + 3x - 2$
$f'(x) = 5x^4 + 3$
$f'(1) = 5(1)^4 + 3$

switch

$f(1) = 2$ $(f^{-1})(2) = 1$

$f'(1) = 8$ $(f^{-1})'(2) = \frac{1}{8}$

reciprocal

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2. If $f(2) = 3$, $f'(2) = 4$, and $g(x)$ is the inverse function to $f(x)$, the equation of the tangent line to $g(x)$ at $x = 3$ is:

~~(A)~~ $y - 2 = -\frac{1}{4}x - 3$

~~(B)~~ $y - 2 = 4(x - 3)$

~~(C)~~ $y - 3 = -\frac{1}{4}x - 2$

(D) $y - 2 = \frac{1}{4}(x - 3)$ → $y - y_1 = m(x - x_1)$
$y - 3 = \frac{1}{4}(x - 2)$

(E) $y - 3 = \frac{1}{4}(x - 2)$

pt. for $g(x) \rightarrow (3,2)$

switch

$f(2) = 3$ $g(3) = 2$

$f'(2) = 4$ $g'(3) = \frac{1}{4}$

reciprocal

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inverse

3. If $f(x) = 3x^2 - x$, and $g(x) = f^{-1}(x)$, then $g'(10)$ could be

(A) 59 **(B)** $\frac{1}{59}$ **(C)** $\frac{1}{10}$ **(D)** 11 **(E)** $\boxed{\frac{1}{11}}$

$f(x) = 10$
$3x^2 - x = 10$
$3x^2 - x - 10 = 0$
$(3x+5)(x-2) = 0$
$x = -5/3,\ x = 2$

$f'(x) = 6x - 1$
$f'(2) = 11$

switch

$f(2) = 10$ $g(10) = 2$

$f'(2) = 11$ $g'(10) = \frac{1}{11}$

reciprocal

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4. 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 $g'(3)$?

inverse

(A) $\boxed{-\frac{1}{2}}$ **(B)** $-\frac{1}{8}$ **(C)** $\frac{1}{6}$ **(D)** $\frac{1}{3}$

$f(6) = 3$ $g(3) =$

$f'(6) = -2$ $g'(3) = -\frac{1}{2}$

reciprocal