AP Calculus AB – Worksheet 122 **Derivative of Inverse Functions**

1. Let $f(x)=x^3-5x^2-8$ and let g be the inverse function of f.
   (a) Find $f(1)$ and $f'(1)$.
   (b) Find $g(-12)$ and $g'(-12)$.

2. Let f be the function defined by $f(x)=x^3+7x+2$. If $g(x)=f^{-1}(x)$ and $f(1)=10$, what is the value of $g'(10)$?

3. Let f be the function defined by $f(x)=x^5+3x^3+7x+2$. If $g(x)=f^{-1}(x)$ and $f(1)=13$, what is the value of $g'(13)$?

4. Let f be the function defined by $f(x)=7x^3+(\ln x)^3$. If $g(x)=f^{-1}(x)$ and $f(1)=7$, what is the value of $g'(7)$?

5. Let f be the function defined by $f(x)=x^7+2x+9$. The point $(1,12)$ is on the graph of f. If $g(x)=f^{-1}(x)$, find $g'(12)$.

6. Find the equation of the tangent line to the inverse of $f(x)=x^5+2x^3+x-4$ at the point $(-4,0)$.

7. Find the equation of the tangent line to the inverse of $f(x)=7x+\sin(2x)$ at the point $(0,0)$.

8. Find the equation of the tangent line to the inverse of $f(x)=x^3+8x+\cos(3x)$ at the point $(1,0)$.

9. The functions f and g are differentiable. Given that $g(x)=f^{-1}(x)$, $f(1)=3$, and $f'(1)=-5$, find $g'(3)$.

10. The functions f and g are differentiable. Given that $g(x)=f^{-1}(x)$, $f(2)=4$, $f(4)=-6$, $f'(2)=7$, and $f'(4)=11$, find $g'(4)$.

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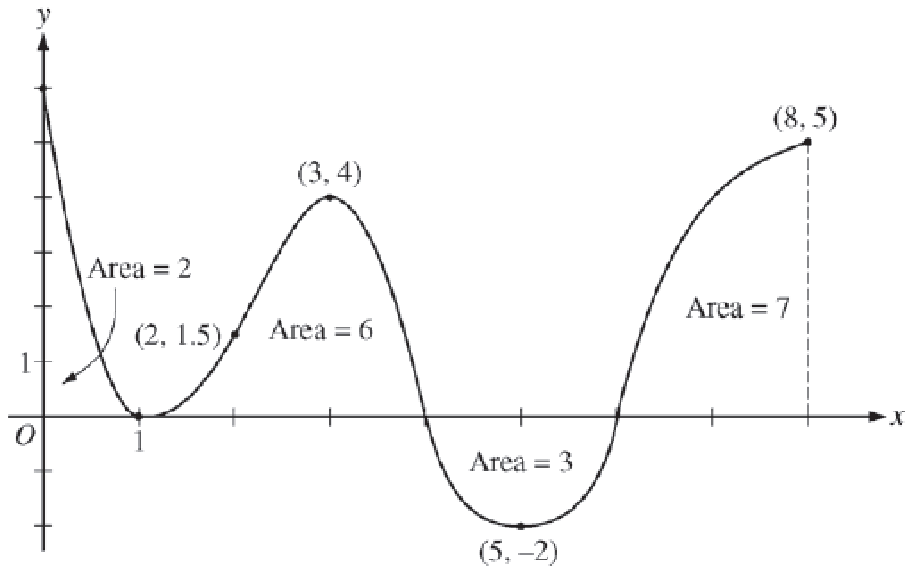

Graph of f'

4. The figure above shows the graph of f', the derivative of a twice-differentiable function f, on the closed interval $0 \le x \le 8$. The graph of f' has horizontal tangent lines at $x = 1$, $x = 3$, and $x = 5$. The areas of the regions between the graph of f' and the x-axis are labeled in the figure. The function f is defined for all real numbers and satisfies $f(8) = 4$.

(a) Find all values of x on the open interval $0 < x < 8$ for which the function f has a local minimum. Justify your answer.

(b) Determine the absolute minimum value of f on the closed interval $0 \le x \le 8$. Justify your answer.

(c) On what open intervals contained in $0 < x < 8$ is the graph of f both concave down and increasing? Explain your reasoning.

(d) The function g is defined by $g(x) = (f(x))^3$. If $f(3) = -\frac{5}{2}$, find the slope of the line tangent to the graph of g at $x = 3$.