

AP CALCULUS AB

INVERSE FUNCTION THEOREM

Problems 1 through 3 concern the function

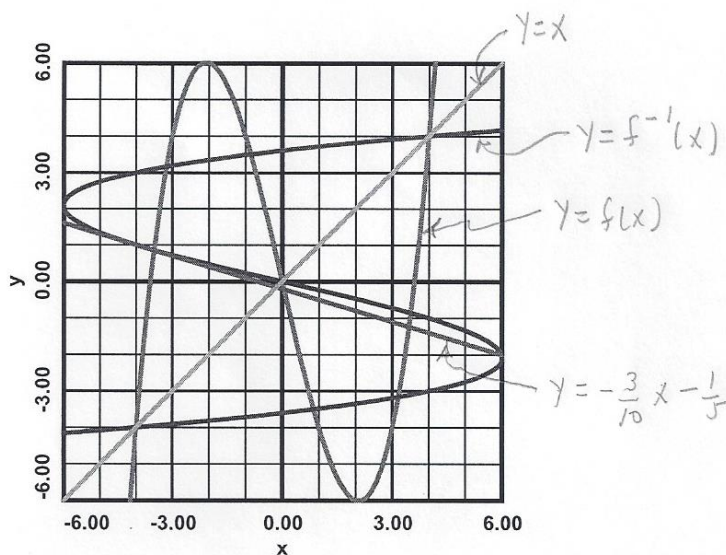
$$f(x) = \frac{1}{3}(x^3 - 13x). \quad f(1) = -4$$

- 1) Graph  $y = f(x)$  on the grid below.
- 2) Graph  $y = f^{-1}(x)$  on the grid below by switching  $x$  and  $y$  in  $y = f(x)$ . Include the line  $y = x$  on the graph.
- 3) Find the equation of the line tangent to  $y = f^{-1}(x)$  at the point  $(x, y) = (-4, 1)$ . Graph the tangent line.

$$f'(x) = \frac{1}{3}(3x^2 - 13)$$

$$f'(1) = -\frac{10}{3}$$

$$\left. \frac{df^{-1}}{dx} \right|_{(-4, 1)} = -\frac{3}{10}$$



$$y = -\frac{3}{10}x + b$$

$$1 = -\frac{3}{10}(-4) + b$$

$$b = -\frac{1}{5}$$

$$y = -\frac{3}{10}x - \frac{1}{5}$$