3. (5 points) Suppose that f and g are functions such that

$$f(g(x)) = x \qquad (*)$$

for every x, and that $f'(x) = \frac{1}{x}$. Prove that $g'(x) = g(x)$ by differentiating $(*)$.

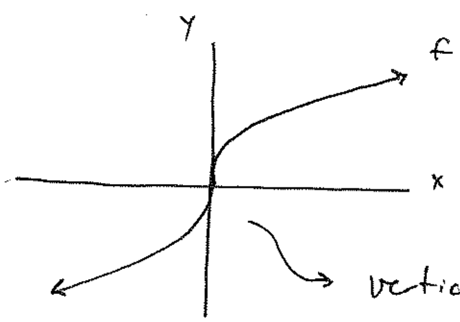
By the chain rule:

$$1 = \frac{d}{dx} x = \frac{d}{dx} f(g(x)) = f'(g(x))\, g'(x)$$

$$= \frac{1}{g(x)}\, g'(x)$$

Multiply by $g(x)$ to get $g = g'$.

4. (5 points) Draw the graph of a function f which is continuous on $(-\infty, \infty)$, differentiable on $(-\infty, 0) \cup (0, \infty)$ (and *not* differentiable at 0), and $f'(x) > 0$ wherever f is differentiable.



vertical tangent at 0.

Example function: $x^{1/3}$.