

1. Find $(f^{-1})'(2)$ if $f(x) = x^3 + x^2$.

Notice that $y = 2$ when $x = 1$.

Hence

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

Now,

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

hence

$$(f^{-1})'(2) = \frac{1}{3+2} = \frac{1}{5}.$$

2. Find a function whose derivative is $\frac{3}{\sqrt{1-9x^2}}$.

This looks like

$$\frac{d}{dx}(\sin^{-1}(x)) = \frac{1}{\sqrt{1-x^2}}.$$

Try

$$\frac{d}{dx}(\sin^{-1}(3x)) = \frac{1}{\sqrt{1-(3x)^2}} \cdot 3$$

$$= \frac{3}{\sqrt{1-9x^2}}.$$