

1. Let $f(x) = x^3 + 2x$. (You can take it as given that f is a one-to-one function and therefore has an inverse function, which we call f^{-1} .)
- (a) Find $f^{-1}(3)$
- (b) Find $(f^{-1})'(3)$

(a) To find $f^{-1}(3)$, set $f(x) = 3$.

$$\Rightarrow x^3 + 2x = 3$$

$$\Rightarrow x^3 + 2x - 3 = 0$$

$$\Rightarrow x = 1 \quad (\text{by inspection, and since } f \text{ is 1-1})$$

$$\Rightarrow \boxed{f^{-1}(3) = 1} \quad (\text{there can only be one solution to } f(x) = 3)$$

(b) Use the formula: $(f^{-1})'(x) = \frac{1}{f'(f^{-1}(x))}$

$$\text{So } (f^{-1})'(3) = \frac{1}{f'(f^{-1}(3))} = \frac{1}{f'(1)}$$

$$f'(x) = 3x^2 + 2 \Rightarrow f'(1) = 5$$

$$\text{So } \boxed{(f^{-1})'(3) = \frac{1}{5}}$$