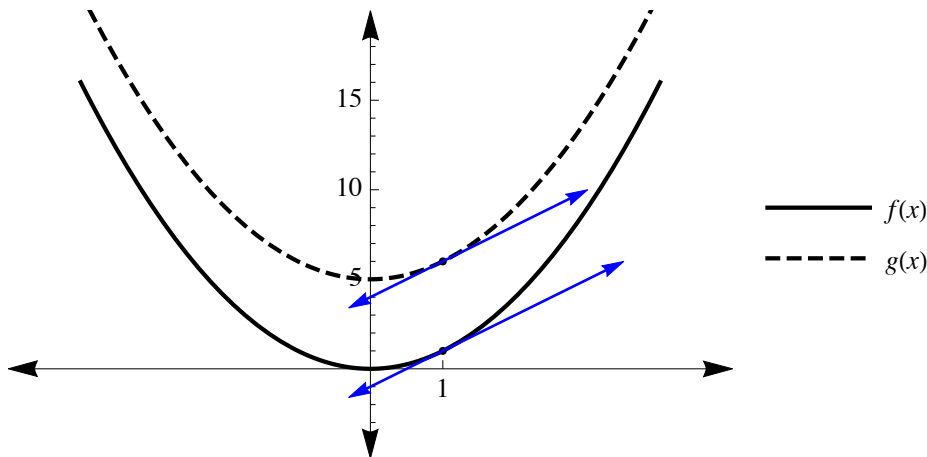


Slope Function for $f(x) = x^n + k$ (Vertical Translation)

Let's compare and contrast the graphs $f(x) = x^2$ and $g(x) = x^2 + 5$.



Adding a constant to a function cause the function to translate (shift) up and down vertically.

Clearly, at $x = 1$, $g(x)$ has the same slope as $f(x)$. By drawing a series of tangent lines on both curves and finding their slopes, we can see the relationship:

x	-4	-3	-2	-1	0	1	2	3	4
$f'(x)$	-8	-6	-4	-2	0	2	4	6	8
$g'(x)$	-8	-6	-4	-2	0	2	4	6	8

For any given x value the slope of $g(x)$ is equal to the slope of $f(x)$. Since $f'(x) = 2x$,

$$g'(x) = f'(x) = 2x$$

In general, if $f(x) = x^n + k$, where k is some real-number, then

$$f'(x) = n x^{n-1}$$

Example

If $f(x) = x^{10} - 25$ what is $f'(x)$?

Solution

$$f'(x) = 10 \cdot x^{10-1} = 10x^9$$