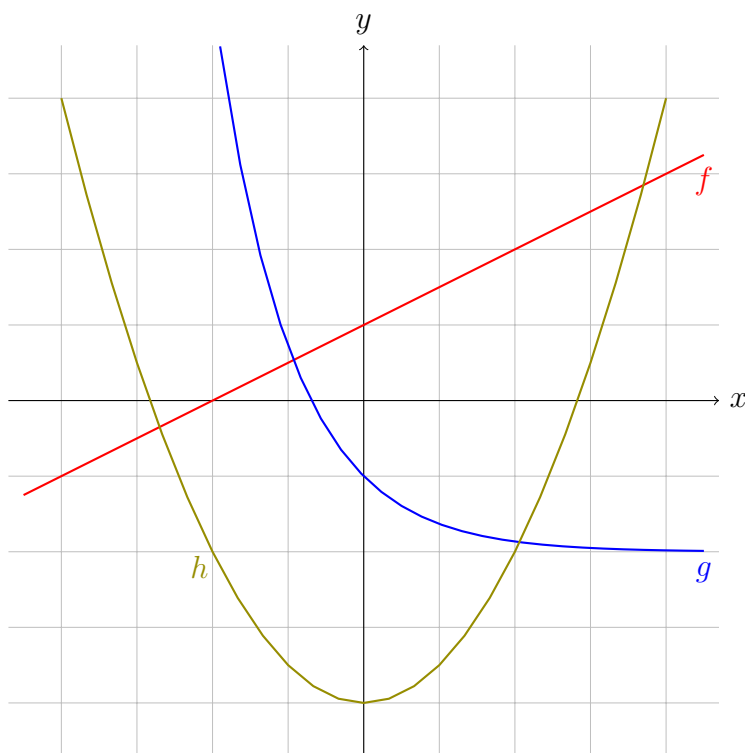


Functions: Increasing and Decreasing Functions

Video companion

1 Introduction



- f is *strictly increasing*
- g is *strictly decreasing*
- h is neither

Let $f : \mathbb{R} \rightarrow \mathbb{R}$,

f is strictly increasing if whenever $a < b$, we have $f(a) < f(b)$.

f is strictly decreasing if whenever $a < b$, we have $f(a) > f(b)$.

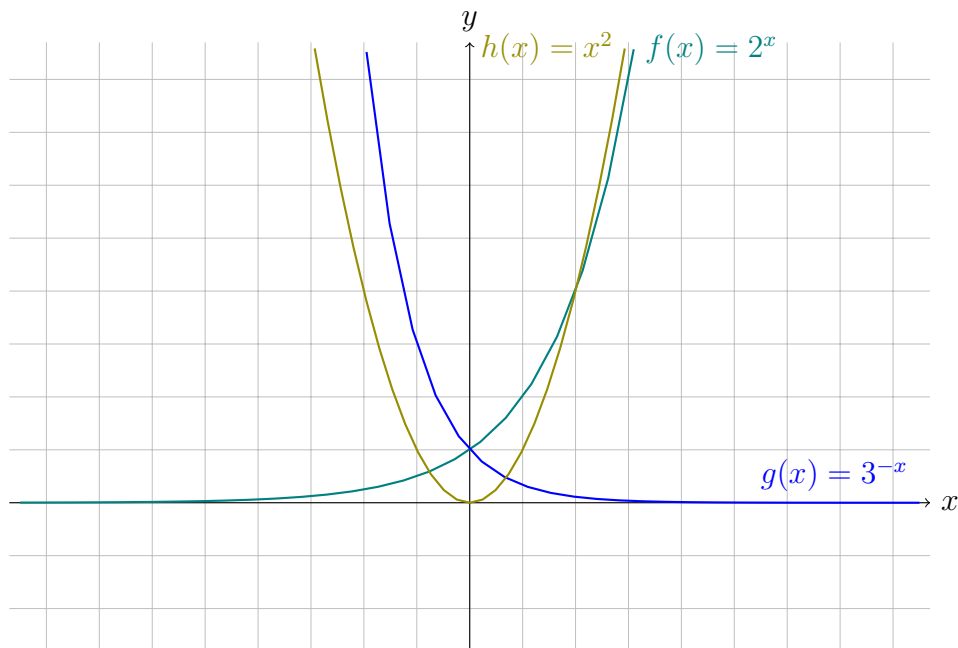
2 Examples

$$f(x) = 2^x \quad (\text{exponential function})$$

$$g(x) = 3^{-x}$$

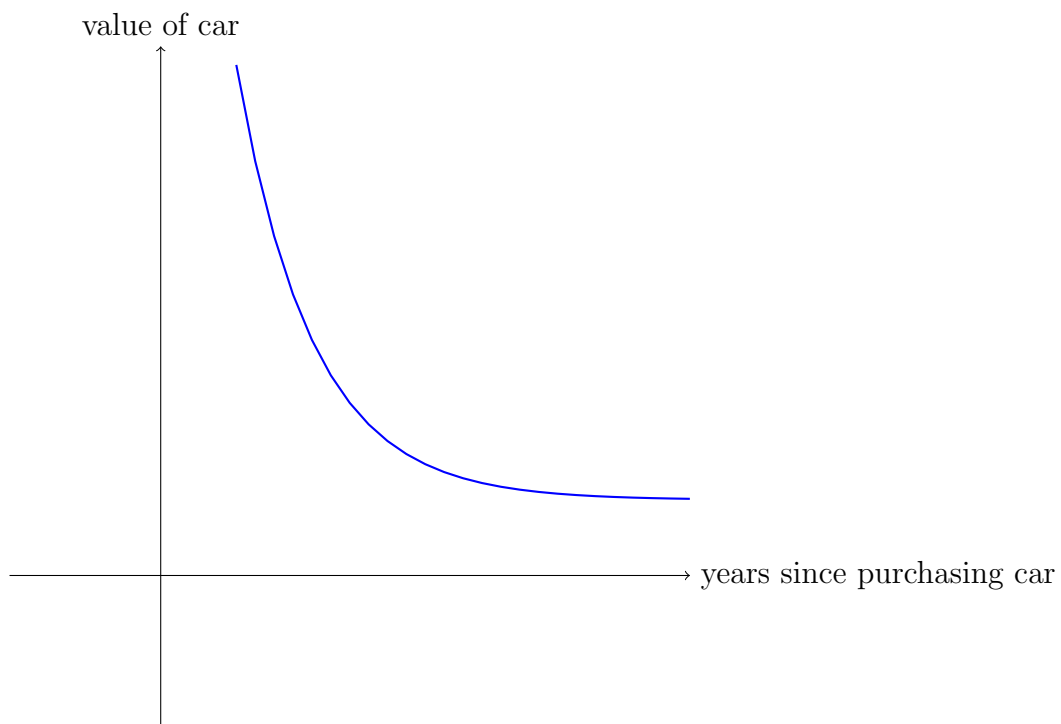
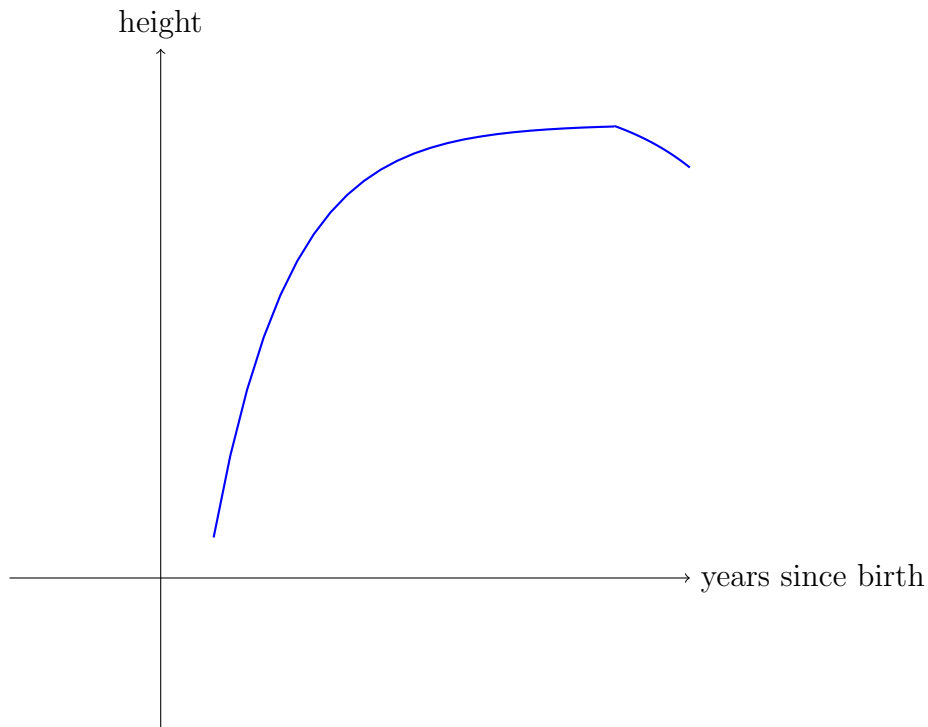
$$h(x) = x^2$$

x	$f(x)$	x	$g(x)$	x	$h(x)$
0	$2^0 = 1$	0	$3^0 = 1$	0	$0^2 = 0$
1	$2^1 = 2$	1	$3^{-1} = \frac{1}{3}$	1	$1^2 = 1$
2	$2^2 = 4$	2	$3^{-2} = \frac{1}{9}$	2	$2^2 = 4$
3	$2^3 = 8$	3	$3^{-3} = \frac{1}{27}$	3	$3^2 = 9$
-1	$2^{-1} = \frac{1}{2}$	-1	$3^1 = 3$	-1	$(-1)^2 = 1$

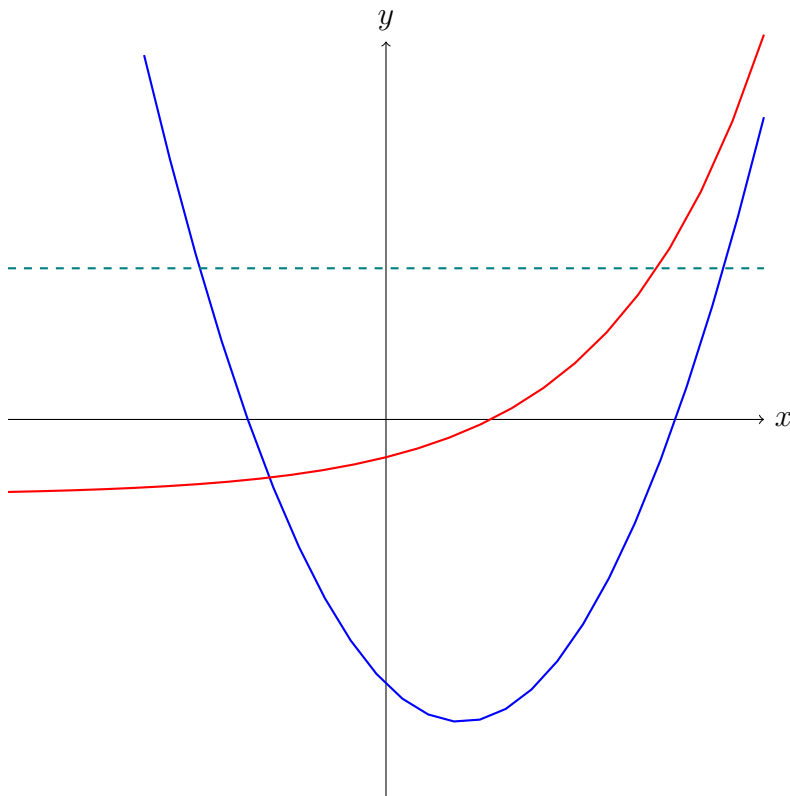


- f is strictly increasing
- g is strictly decreasing
- h is neither
 - h is strictly increasing on $[0, \infty)$
 - h is strictly decreasing on $(-\infty, 0]$

3 “Real-world” examples



4 Horizontal line test



A function is strictly increasing or strictly decreasing if a horizontal line crosses it only once.