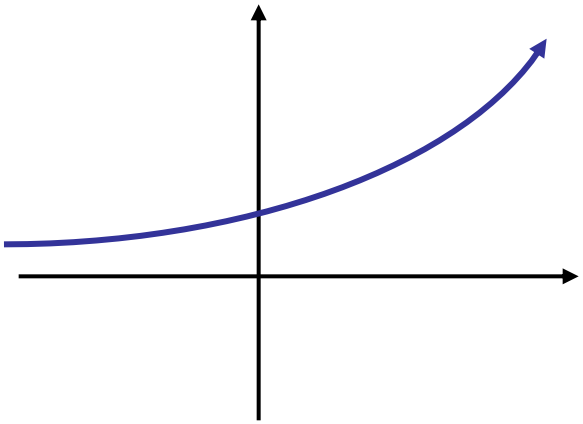
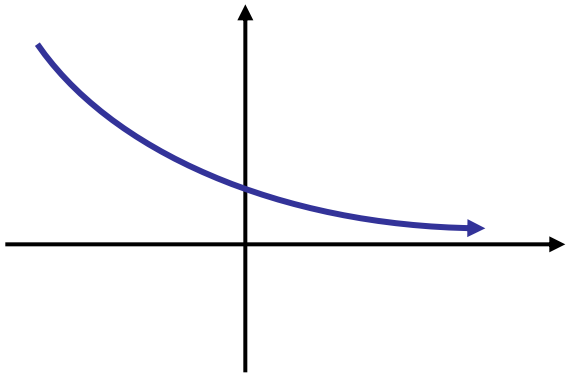
Chapter 4 - Curve Sketching

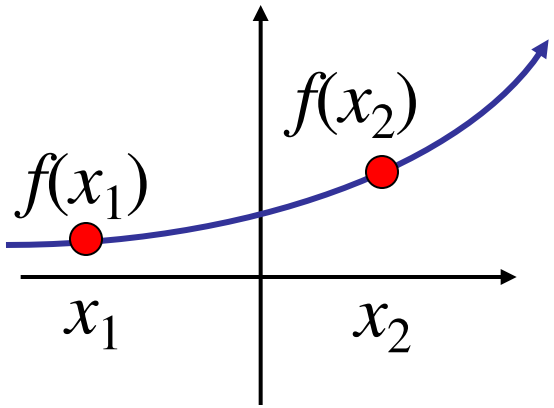
4.1 Increasing and Decreasing Functions



function is increasing

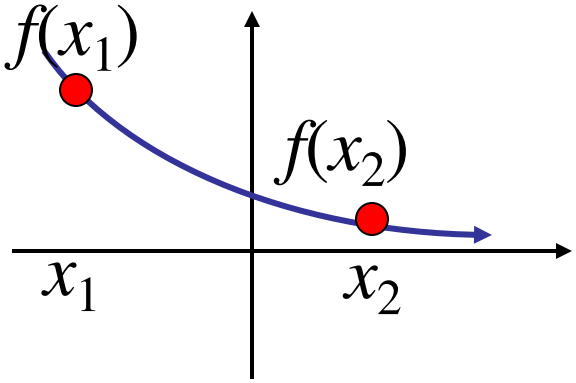


function is decreasing



If $x_1 < x_2$ and $f(x_1) < f(x_2)$ then the function is increasing.

The slope is **positive**



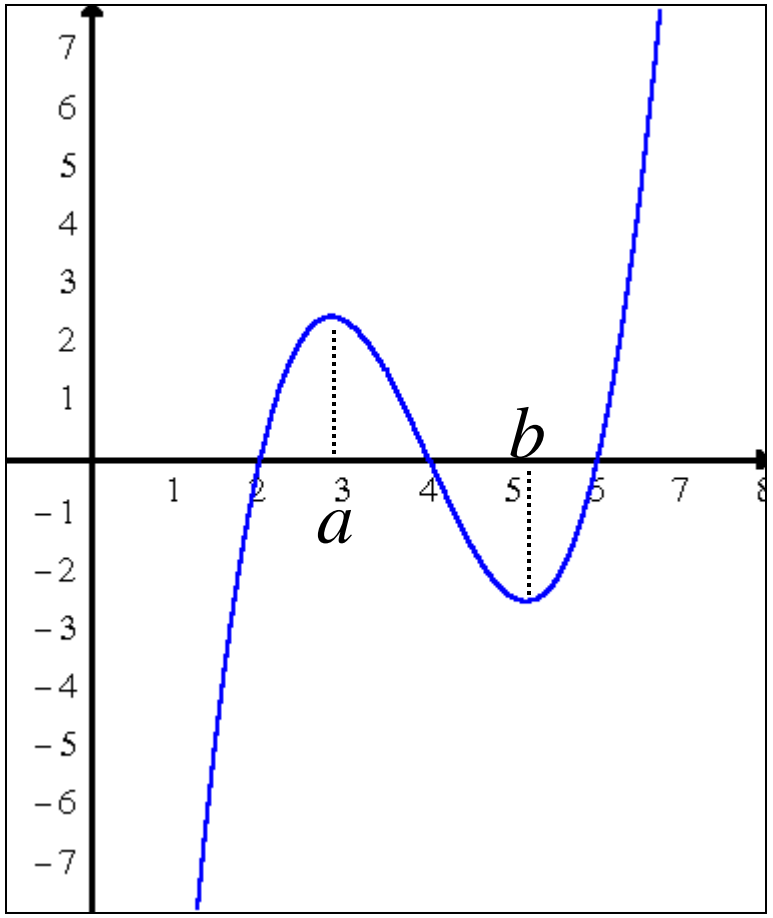
If $x_1 < x_2$ and $f(x_1) > f(x_2)$ then the function is decreasing.

The slope is **negative**

For the interval
$-\infty < x < a$ the function
is increasing.

For the interval
$a < x < b$ the function
is decreasing.

For the interval
$b < x < \infty$ the function
is increasing.



(1)

$$f(x) = x^2 + 2x - 3$$

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

If $2x + 2 > 0$

$$2x > -2$$

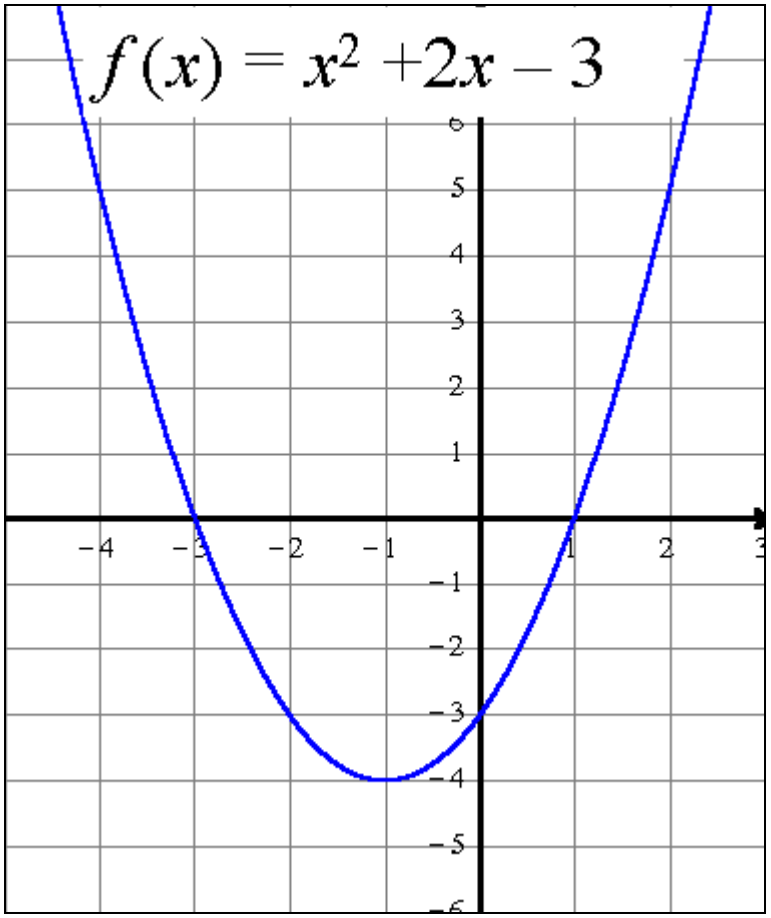
$$x > -1$$

slope is positive

If $2x + 2 < 0$

$$x < -1$$

slope is negative



(2)

$$f(x) = -\frac{1}{3}x^3 + \frac{1}{2}x^2 + 6x$$

$$f'(x) = -x^2 + x + 6$$

$$= -(x^2 - x - 6)$$

$$= -(x + 2)(x - 3)$$

	$x < -2$	$-2 < x < 3$	$x > 3$
$f'(x)$	—	+	—
$f(x)$	↘	↗	↘
	decreasing	increasing	decreasing

(2)

$$f(x) = -\frac{1}{3}x^3 + \frac{1}{2}x^2 + 6x$$

$$f'(x) = -x^2 + x + 6$$

$$= -(x^2 - x - 6$$

$$= -(x + 2)(x - 3)$$