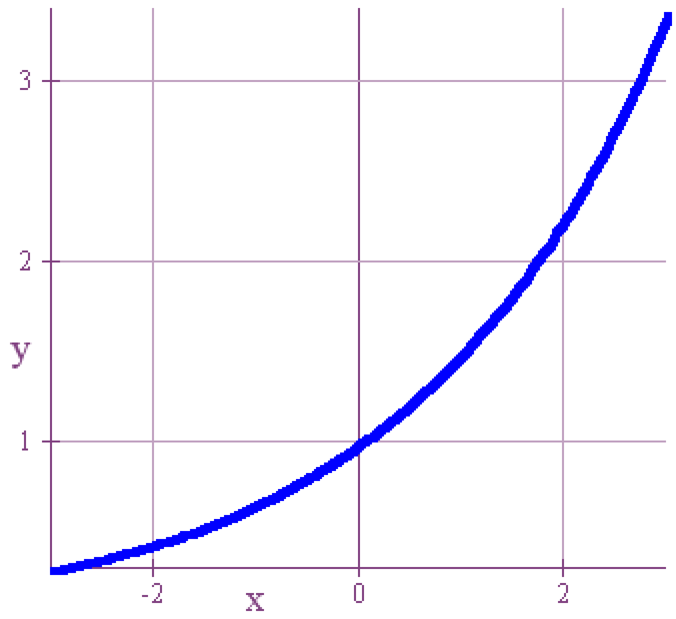
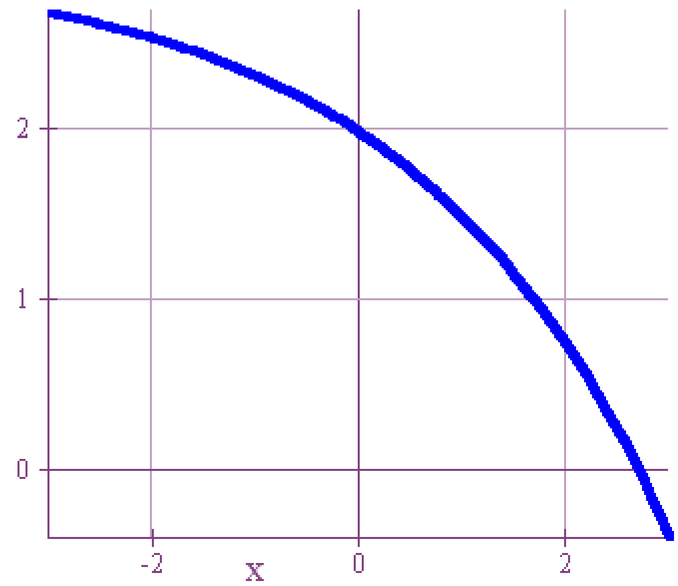
INCREASING AND DECREASING FUNCTIONS

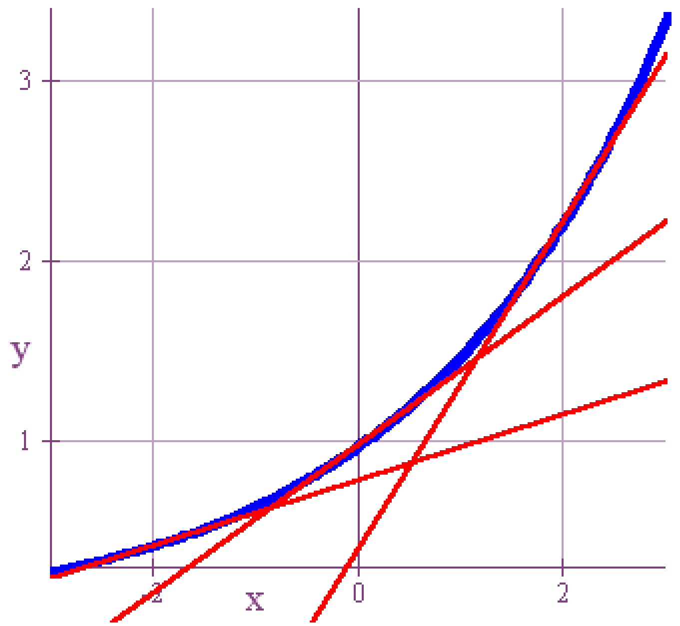
Visually, we say that a function is increasing if the graph rises as we go from left to right.



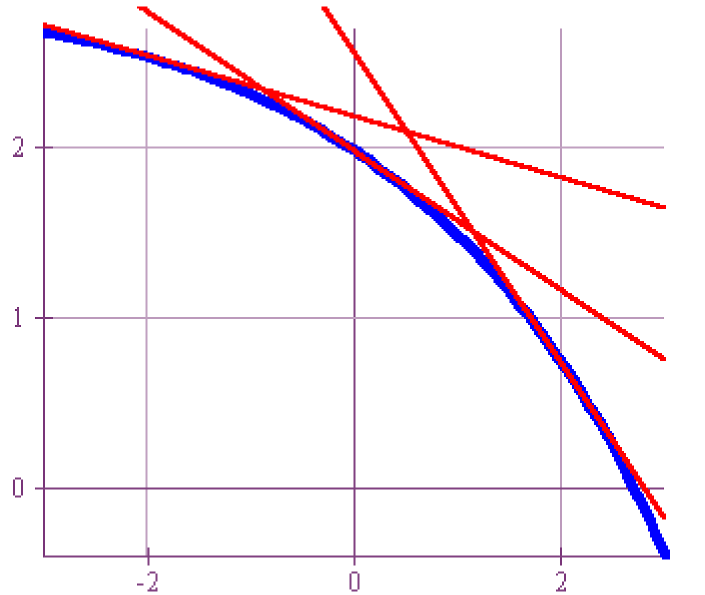
And a function is decreasing if the graph falls as we go from left to right.



Notice that if we add some tangent lines to our increasing graph, then all the tangent lines have positive slopes.



Similarly, if we add tangent lines to our decreasing graph, then all the tangent lines have negative slopes.



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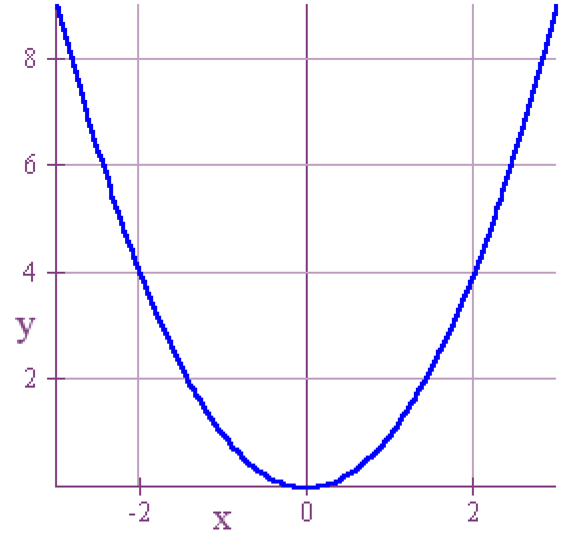
Here’s an example.

$$f(x) = x^2$$



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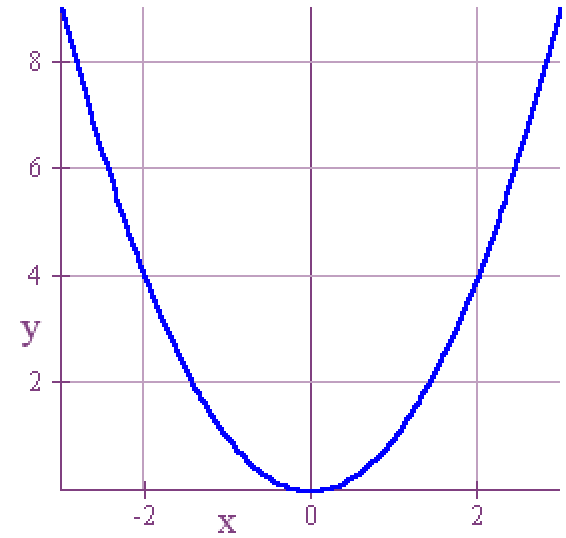
$$f(x) = x^2$$

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



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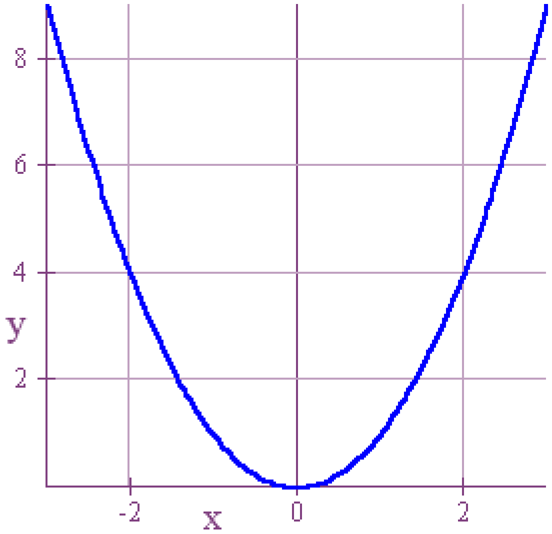

$$f'(x) > 0 \text{ if } x > 0$$

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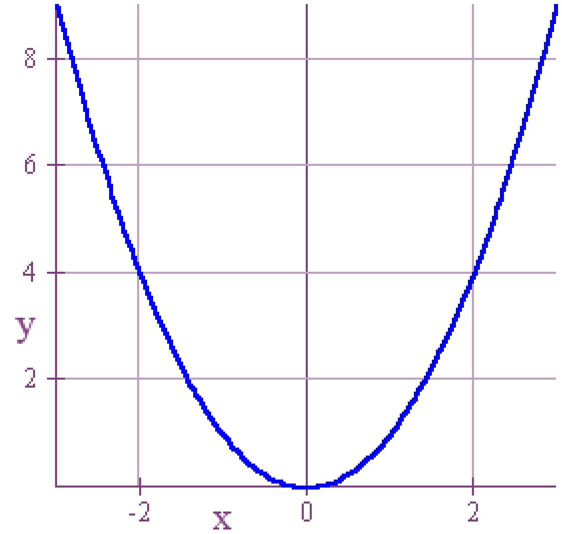


$$f'(x) = 2x$$

$$f'(x) > 0 \text{ if } x > 0$$

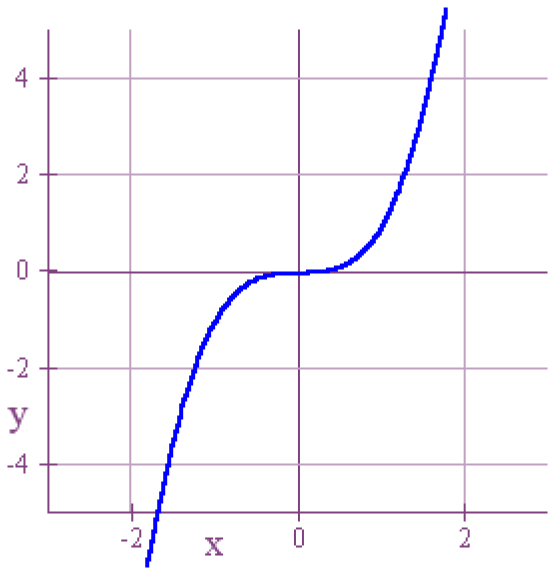
$$f'(x) < 0 \text{ if } x < 0$$

$$f(x) \text{ is increasing on } (0, \infty)$$

$$f(x) \text{ is decreasing on } (-\infty, 0)$$

Here’s another example.

$$f(x) = x^3$$



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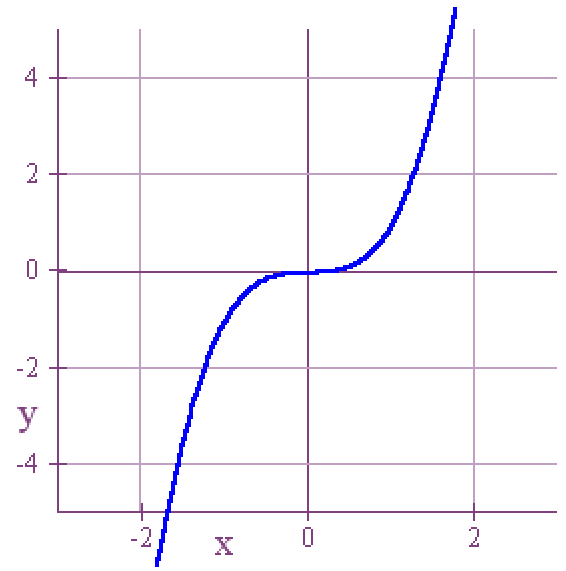

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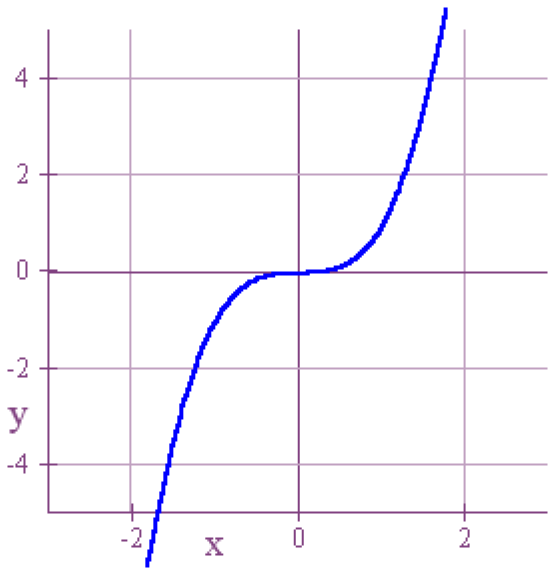

$$f'(x) > 0 \text{ if } x < 0 \text{ or } x > 0$$

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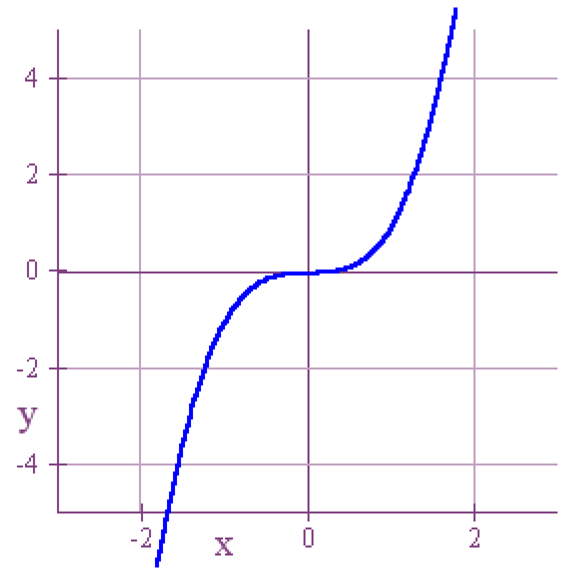

$$f'(x) = 3x^2$$

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$$f(x) \text{ is increasing on} \left(-\infty, 0\right) \text{ and}$$
$$f(x) \text{ is increasing also on} \left(0, \infty\right).$$