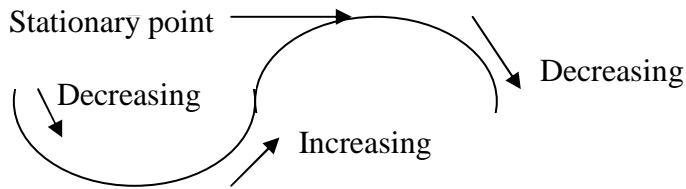


## Increasing and Decreasing Functions

A positive gradient means the function is increasing  $f'(x) > 0$

A negative gradient means the function is decreasing  $f'(x) < 0$

When the gradient is zero then it is a stationary point  $f'(x) = 0$



*Example 1.* For what values of  $x$  is the function  $f(x) = 3x^2 + 4x - 3$  increasing?

$$f(x) = 3x^2 + 4x - 3$$

$$f'(x) = 6x + 4 \quad \text{for increasing function } f'(x) > 0$$

$$\therefore 6x + 4 > 0$$

$$6x > -4$$

$$x > -\frac{4}{6} \quad \text{or} \quad x > -\frac{2}{3}$$

so the function is increasing when  $x > -\frac{2}{3}$

*Example 2.* For what values of  $x$  is the function  $f(x) = 2x^3 - 3x^2 + 6$  decreasing?

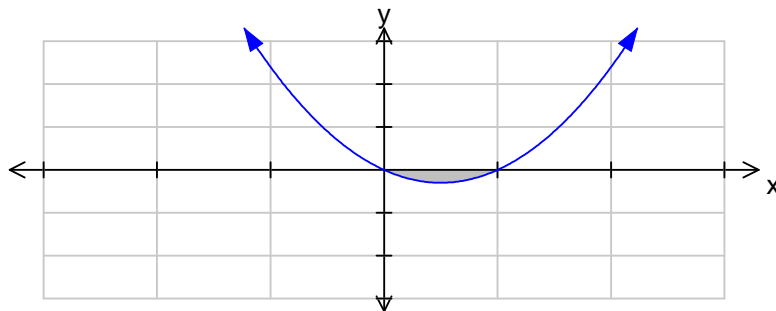
$$f(x) = 2x^3 - 3x^2 + 6$$

$$f'(x) = 6x^2 - 6x \quad \text{for decreasing function } f'(x) < 0$$

$$\therefore 6x^2 - 6x < 0$$

$$6x(x - 1) < 0$$

critical values are  $x = 0$  and  $x = 1$



So the function is decreasing when  $0 < x < 1$