

## Calculus 6.4 Key Points

### Mean Value Theorem for Integrals:

If  $f$  is continuous on  $[a, b]$ , then there is at least one point in the interval  $(a, b)$  where  $x = c$  such that  $\frac{1}{b-a} \int_a^b f(x) dx = f(c)$

In other words, suppose a function  $f(x)$  is continuous over the interval  $(a, b)$ . If you integrate  $f(x)$  over that interval and divide by  $(b - a)$ , that will tell you what the average value of the function is over that interval (i.e. what the value of  $f(x)$  is, on average).

The Mean Value Theorem says that there must be at least one point along that interval where the function is equal to that average value.

### Mean Value Theorem for Derivatives:

If  $F$  is continuous on  $[a, b]$  and differentiable on  $(a, b)$ , then there is at least one point in the interval  $(a, b)$  where  $x = c$  such that  $\frac{F(b)-F(a)}{b-a} = F'(c) = f(c)$

In other words, suppose a function  $F(x)$  is continuous on  $[a, b]$  and differentiable over the interval  $(a, b)$ . Take the slope over that interval,  $\frac{F(b)-F(a)}{b-a}$ .

The Mean Value Theorem says that there must be at least one point along that interval where the derivative of the function,  $F'(c)$ , at that point is equal to the slope over the entire interval.