If You See	You Should Think
f(x) is a continuous function on [a,b].	Intermediate Value Theorem
Which values must $f(x)$ take?	If f(x) is continuous on [a,b], it must take all values between f(a)
	and f(b). That simply means that a continuous function does not
	skip any values between its start and end points.
	Note: however, it can also take finite values larger or smaller than
	f(a) and $f(b)$ . There is no limit on $f(x)$ taking finite values that are
	<u>not</u> between $f(a)$ and $f(b)$ .
f(x) is a <u>continuous</u> function on [a,b].	Extreme Value Theorem
Must f(x) attain both a maximum and a	If f(x) is continuous on [a,b], it must attain both a maximum and a
minimum on [a,b]?	minimum on that interval.
f(x) is a <u>continuous</u> function on [a,b]	Mean Value Theorem for Derivatives
and is <u>differentiable</u> on (a,b). Is the	If $f(x)$ is continuous on $[a,b]$ and differentiable on $(a,b)$ , there
even a slope $\Delta y$ between the	must be at least one point c in the interval where
average slope $\frac{\Delta x}{\Delta x}$ between the	$\Delta y = f(b) - f(a) = f'(a)$
endpoints ever equal to the derivative	$\frac{1}{\Delta x} = \frac{1}{b-a} = f(c)$ .
in the interval?	$\Delta y$
	Note: there may be more than one value c where $\frac{f}{\Delta x} = f'(c)$ .
f(x) is a <u>continuous</u> function on [a,b]	Rolle's Theorem
and is <u>differentiable</u> on (a,b) and	If $f(x)$ is continuous on $[a,b]$ and differentiable on $(a,b)$ and $f(a) =$
f(a) = f(b) = 0. Must there be a value c	f(b) = 0, there must be at least one point c in the interval where
in the interval where f'(c) = 0?	f'(c) = 0.
f(x) is <u>differentiable</u> on (a,b)	f(x) <u>differentiable</u> on (a,b) implies $f(x)$ is <u>continuous</u> on (a, b).
f(x) is a <u>continuous</u> function on [a,b]	Fundamental Theorem of Integral Calculus I
and define the anti-derivative function:	$T(x) = d \int_{x}^{x} f(x) h(x) dx$
$\mathbf{F}(x) = \int_{0}^{x} \mathbf{f}(x) \mathbf{k}$	$F'(x) = \frac{1}{dx} \int f(t)dt = f(x).$
$F(x) = \int f(t)dt$	Note: this theorem cave that any continuous function $f(x)$ has an
a Is $\mathbf{F}(\mathbf{x})$ differentiable and what is its	Note: this theorem says that any continuous function $f(x)$ has an antiderivative $F(x)$ and the derivative of the anti-derivative is the
r(x) univertiable and what is its derivative?	and derivative $F(x)$ and the derivative of the anti-derivative is the original function $f(x)$
	original function f(x).
	Note: if the upper bound is a function of x, then the derivative is
	d f
	found using the chain rule: $F'(x) = \frac{1}{dx} \int_{a}^{b} f(t)dt = f(g(x))g'(x)$ .
f(x) is a <u>continuous</u> function on [a,b]	Fundamental Theorem of Integral Calculus II
and with anti-derivative F(x). What is	
<i>b</i>	$\int f(x)dx = F(b) - F(a).$
$\int f(x)dx$	
a	This means that one may find the definite integral by finding the
	anti-derivative F(x) and evaluating at the bounds, a and b.
I(x) is a <u>continuous</u> function on [a,b].	rirst wiean value i neorem for integrals
vy nat is the <u>average value</u> of I(x) on the intervol <sup>2</sup>	$f = \frac{1}{\int_{0}^{b} f(x) dx}$
interval:	$\int avg = b - a \frac{J}{a} \int (x) dx$
	This means that the average of $f(x)$ on [a,b] is the area divided by
	the interval length.

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