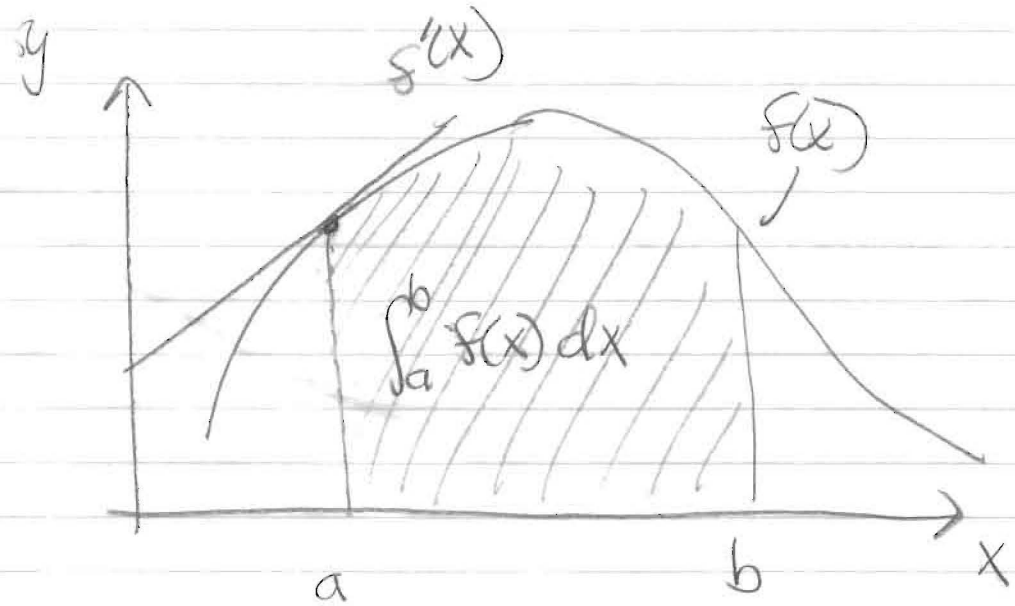
Lecture Notes

Section 5.3
Fundamental Th. of Calc.

I What You Know So Far

	"derivative"		"antiderivative"
$f''(x)$	$f'(x)$	$f(x)$	$F(x)$
$\frac{d^2f}{dx^2}$	$\frac{df}{dx}$	function	$\int f(x)\,dx$
curvature	slope of tangent		RIEMANN SUM AREA UNDER CURVE
<0 cupped down	<0 decreasing		
>0 cupped up	>0 increasing		
$=0$ inflection	$=0$ min/max inflection		



II) Fundamental Theorem of Calculus Establish connection between differention & integral calculus.

Section 5.4 - The Fundamental Theorem of Calc

HW:

Top Board

Fund Th of Calc

① If $g(x) = \int_a^x f(t)\,dx$ then $g'(x) = f(x)$

② $\int_a^b f(x)\,dx = F(b) - F(a)$ where
F is antiderivative of f, i.e.
$F' = f$ so long as x is defined on (a,b)

I) Fund Theorem of Arithmetic...
Any Positive Integer has only <u>one</u> prime factorization

Fund Th. of Algebra...
An N^{th}-degree polynomial has n-roots

II) Fundamental Th of Calculus... see above

III) <u>Example</u>

$$\frac{d}{dx}\left[\int_3^x \cos(t)\,dt\right] = \frac{d}{dx}\left[\sin(t)\Big|_3^x\right]$$

$$= \frac{d}{dx}\left[\sin(x) - \sin(3)\right]$$

$$= \cos(x) - 0$$

IV) Example

$$\frac{d}{dx}\left[\int_{100}^{x} e^t \sin^2 t + \frac{t^2+t+2}{\sqrt{t-1}}\, dt\right]$$

$$= e^x \sin^2 x + \frac{x^2+x+2}{\sqrt{x-1}}$$

V: Conceptual: Inverse Processes