Formulas

Differentiation

We assume that u is a differentiable function of x.

$\frac{d}{dx}(c)=0$	$\frac{dy}{dx}=\frac{dy}{du}\cdot\frac{du}{dx}$
$\frac{d}{dx}\left(x^n\right)=n\,x^{n-1}$	$\frac{d}{dx}\left(u^n\right)=n\,u^{n-1}\frac{du}{dx}$
$\frac{d}{dx}\left[c\ f(x)\right]=c\,f'(x)$	$\frac{d}{dx}(\ln u)=\frac{1}{u}\frac{du}{dx}$
$\frac{d}{dx}\left[f(x)\pm g(x)\right]=f'(x)\pm g'(x)$	$\frac{d}{dx}\left(e^u\right)=e^u\frac{du}{dx}$
$\frac{d}{dx}\left[f(x)g(x)\right]=f(x)g'(x)+f'(x)g(x)$	$\frac{d}{dx}(\log_b u)=\frac{1}{(\ln b)u}\cdot\frac{du}{dx}$
$\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right]=\frac{g(x)f'(x)-f(x)g'(x)}{\left[g(x)\right]^2}$	$\frac{d}{dx}\left(a^u\right)=a^u(\ln a)\frac{du}{dx}$

Integration

$\int k\,dx=kx+C$	$\int\left[f(x)\pm g(x)\right]dx=\int f(x)\,dx\pm\int g(x)\,dx$
$\int x^n dx=\frac{x^{n+1}}{n+1}+C,\ n\neq-1$	$\int[u(x)]^n du=\frac{u^{n+1}}{n+1}+C$
$\int e^x dx=e^x+C$	$\int e^u du=e^u+C$
$\int kf(x)dx=k\int f(x)dx$	$\int\frac{1}{u}du=\ln\lvert u\rvert+C,\ u\neq0$

Least Squares Approximation

$$\hat{y}=\hat{a}+\hat{b}\,x$$

$$\hat{a}=\frac{\left(\sum_n x_i^{\,2}\right)\left(\sum_n y_i\right)-\left(\sum_n x_i\right)\left(\sum_n x_i y_i\right)}{n\sum_n x_i^{\,2}-\left(\sum_n x_i\right)^2}$$ and

$$\hat{b}=\frac{\sum_n x_i\sum_n y_i-n\sum_n x_i y_i}{\left(\sum_n x_i\right)^2-n\sum_n x_i^{\,2}}$$