Matematiikan peruskurssi

Derivative

- $D(f(x)g(x)) = f'(x)g(x) + f(x)g'(x)$
- $D\left(\frac{f(x)}{g(x)}\right) = \frac{f'(x)g(x) - f(x)g'(x)}{(g(x))^2}$, $g(x) \neq 0$
- $D(g(f(x)) = g'(f(x)) \cdot f'(x)$
- $D(x^r) = rx^{r-1}$, $r \in \mathbb{R}$
- $D \ln x = \frac{1}{x}$, $x > 0$
- $D \sin x = \cos x$
- $D \cos x = -\sin x$
- $De^x = e^x$

Integration

- $\int x^r \, dx = \frac{1}{r+1} x^{r+1} + C$, $r \in \mathbb{R}$, $r \neq -1$, $C \in \mathbb{R}$
- $\int \frac{1}{x} \, dx = \ln |x| + C$, $C \in \mathbb{R}$
- $\int \sin x \, dx = -\cos x + C$, $C \in \mathbb{R}$
- $\int \cos x \, dx = \sin x + C$, $C \in \mathbb{R}$
- $\int e^x \, dx = e^x + C$, $C \in \mathbb{R}$
- $\int f'(x) \cdot g'(f(x)) \, dx = g(f(x)) + C$, $C \in \mathbb{R}$
- $\int f'(x) \cdot g(x) \, dx = f(x) \cdot g(x) - \int f(x) \cdot g'(x) \, dx$ Integration by Parts

Function of two variables

$$D(x, y) = f_{xx}(x, y) \cdot f_{yy}(x, y) - [f_{xy}(x, y)]^2$$

If $D(x, y) > 0$ and $f_{xx}(x, y) < 0$,	then f has a relative maximum at (x, y).
If $D(x, y) > 0$ and $f_{xx}(x, y) > 0$,	then f has a relative minimum at (x, y).
If $D(x, y) < 0$,	then f has neither a maximum nor a minimum at (x, y). Instead, f has a saddle point at (x, y).
If $D(x, y) = 0$	at (x, y), then the second partials test fails and no conclusion can be made.