MB202 cheatsheet

Goniometrické funkce

$$\sin^2 x = \frac{1}{2} \cdot [1 - \cos(2x)]$$
$$\cos^2 x = \frac{1}{2} \cdot [1 + \cos(2x)]$$

Limity

$$x^a << \beta^x << x! << x^x$$
$$\lim_{x\to\infty} \left(1 + \frac{a}{x}\right)^x = e^a$$
$$\lim_{n\to\infty} \left(1 + \frac{1}{n}\right)^n = e$$

$$\lim_{x\to 0} \frac{e^x - 1}{x} = 1 \quad \lim_{x\to 0} \frac{\arcsin(x)}{x} = 1$$
$$\lim_{x\to 0} \frac{\tan(x)}{x} = 1 \quad \lim_{x\to 0} \frac{\sin(x)}{x} = 1$$

L'Hospitalovo pravidlo

$$\lim_{x\to n} \frac{f(x)'}{g(x)'}$$

Taylorův polynom

$$T_n(x) = \sum_{i=0}^{n} \frac{f^{(i)}(x_0)}{i!} \cdot (x - x_0)^i$$
$$R_n(x) = \frac{f^{(n+1)}(c)}{(n+1)!} \cdot (x - x_0)^{n+1}$$
$$f(x) = T_n(x) + R_n(x)$$

Derivace

$$(x^r)' = rx^{r-1}$$
$$(\sin(x))' = \cos(x)$$
$$(\cos(x))' = -\sin(x)$$
$$(\tan(x))' = \frac{1}{\cos^2 x}$$
$$(e^x)' = e^x$$
$$(\ln(x))' = \frac{1}{x}$$
$$(a^x)' = a^x \ln(a)$$
$$(\log_a(x))' = \frac{1}{x \ln(a)}$$
$$(\arcsin(x))' = \frac{1}{\sqrt{1 - x^2}}$$
$$(\arctan(x))' = \frac{1}{\sqrt{1 - x^2}}$$
$$\sinh(x) := \frac{e^x - e^{-x}}{2}$$
$$\cosh(x) := \frac{e^x + e^{-x}}{2} = (\sinh(x))'$$
$$\tanh(x) := \frac{\sinh(x)}{\cosh(x)}$$
$$\tanh(x) := \frac{\cosh(x)}{\sinh(x)}$$

Integrály

Substituce:

$$\int f(\varphi(x)) \cdot \varphi'(x)dx = \int f(y)dx$$
$$y = \varphi(x) \to dy = \varphi'(x) \cdot dx$$

Pér partes:

$$\int uv' = uv - \int u'v$$
$$\int \frac{f'(x)}{f(x)}dx = \ln \mid f(x) \mid + C$$
$$\int \frac{dx}{(x - x_0)^2 + a^2} = \frac{1}{a} \cdot \frac{x - x_0}{a} + C$$

Vícenásobné kořeny v $\mathbb{C}$:

$$K_{n+1}(x_0, a) = \frac{1}{a^2} \cdot \left[\frac{2n-1}{2n} \cdot K_n(x_0, a) + \frac{1}{2n} \cdot \frac{x - x_0}{((x - x_0)^2 + a^2)^n}\right]$$

Zbytek

$$\sqrt[n]{n!} = \sqrt[2n]{2\pi n} \left(\frac{n}{e}\right)$$

TODOS: dopsat tips&tricks k per partes a substituci, l'Hospital, vše vycentrovat