Matematická kartografie, přehled vzorců ke zkoušce

Pravidla pro derivace:

$$(fg)' = f'g + fg' \qquad (f(g(x)))' = g'(x)f'(g(x)) \qquad \left(\frac{f}{g}\right)' = \frac{f'g - g'f}{g^2}$$

Derivace a integrály elementárních funkcí:

$f'(x)$	$f(x)$	$\int f(x)dx$
0	c	$cx + k$
nx^{n-1}	x^n	$\frac{x^{n+1}}{n+1} + k$
$-\frac{1}{x^2}$	$1/x$	$\ln x + k$
$\frac{1}{x}$	$\ln x$	$x \ln x - x + k$
$\frac{1}{x \ln a}$	$\log_a x$	$\frac{x \ln x - x}{\ln a} + k$
e^x	e^x	$e^x + k$
$c^x \ln c$	c^x	$\frac{c^x}{\ln c} + k$
$\cos x$	$\sin x$	$-\cos x + k$
$-\sin x$	$\cos x$	$\sin x + k$
$\frac{1}{\cos^2 x}$	$\tan x$	$-\ln \lvert\cos x\rvert + k$
$-\frac{1}{\sin^2 x}$	$\cot x$	$\ln \lvert\sin x\rvert + k$
$\frac{\sin x}{\cos^2 x}$	$1/\cos x$	$\ln \left\lvert\tan(\frac{x}{2} + \frac{\pi}{4})\right\rvert + k$
$-\frac{\cos x}{\sin^2 x}$	$1/\sin x$	$\ln \left\lvert\tan(\frac{x}{2})\right\rvert + k$

Sférická trigonometrie:

$$\begin{aligned}
\sin\alpha : \sin\beta : \sin\gamma &= \sin a : \sin b : \sin c \\
\cos a &= \cos b \cos c + \sin b \sin c \cos\alpha \\
\cos\alpha &= -\cos\beta\cos\gamma + \sin\beta\sin\gamma\cos a \\
\sin a \cos\beta &= \cos b \sin\gamma - \sin b \cos\gamma \cos\alpha
\end{aligned}$$

Referenční elipsoid:

$$e^2 = \frac{a^2 - b^2}{a^2} \qquad e'^2 = \frac{a^2 - b^2}{b^2}$$

$$x = \frac{a\cos\varphi}{W} \qquad y = \frac{a(1-e^2)\sin\varphi}{W}$$

$$W = \sqrt{1 - e^2 \sin^2\varphi} \qquad M = \frac{a(1-e^2)}{W^3} \qquad N = \frac{a}{W}$$

Kartografická měřítka a zkreslení:

$$
\begin{aligned}
m^2 &= m_p^2 \cos^2 A + m_r^2 \sin^2 A + p \sin A \cos A \\
m_p^2 &= \left[\left(\frac{\partial F}{\partial u}\right)^2 + \left(\frac{\partial G}{\partial u}\right)^2\right] / R^2 \\
m_r^2 &= \left[\left(\frac{\partial F}{\partial v}\right)^2 + \left(\frac{\partial G}{\partial v}\right)^2\right] / \left(R^2 \cos^2 u\right) \\
p &= 2\left(\frac{\partial F}{\partial u}\frac{\partial F}{\partial v} + \frac{\partial G}{\partial u}\frac{\partial G}{\partial v}\right) / \left(R^2 \cos u\right) \\
\tan 2A &= \frac{p}{m_p^2 - m_r^2} \\
\tan \sigma_p &= \frac{\partial G}{\partial u} / \frac{\partial F}{\partial u} \\
\tan \sigma_r &= \frac{\partial G}{\partial v} / \frac{\partial F}{\partial v} \\
\tan \omega' &= \left(\frac{\partial G}{\partial u}\frac{\partial F}{\partial v} - \frac{\partial G}{\partial v}\frac{\partial F}{\partial u}\right) / \left(\frac{\partial F}{\partial u}\frac{\partial F}{\partial v} + \frac{\partial G}{\partial u}\frac{\partial G}{\partial v}\right) \\
P &= \left(\frac{\partial G}{\partial u}\frac{\partial F}{\partial v} - \frac{\partial G}{\partial v}\frac{\partial F}{\partial u}\right) / \left(R^2 \cos u\right) \\
\left|\frac{\partial F}{\partial v}\right| &= \left|\frac{\partial G}{\partial u} \cos u\right|
\end{aligned}
$$

Loxodroma:

$$
\begin{aligned}
v_2 &= v_1 + \rho\left[\ln\left(\tan\frac{2u_2 + \pi}{4}\right) - \ln\left(\tan\frac{2u_1 + \pi}{4}\right)\right] \tan A \\
u_2 &= 2 \arctan\left[\tan\left(\frac{2u_1 + \pi}{4}\right) e^{\frac{v_2 - v_1}{\rho \tan A}}\right] - \frac{\pi}{2}
\end{aligned}
$$