# Accepted Help

(An aid to MAT2 at FCE CTU)

Note: Please do not change it in any way including marginalia. It contains no explanatory, the knowledge of using is supposed.

## A. Fundamental trigonometric formulae

$\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$ (as a consequence $\sin 2x = 2 \sin x \cos x$)
$\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$ (as a consequence $\cos 2x = \cos^2 x - \sin^2 x$)
$\sin^2 x = \frac{1}{2}(1 - \cos 2x)$
$\cos^2 x = \frac{1}{2}(1 + \cos 2x)$

## B. Some fundamental integrals

$$\int \frac{dx}{a^2 + x^2} = \frac{1}{a} \operatorname{arctg} \frac{x}{a} \quad (a \neq 0)$$

$$\int \frac{dx}{x^2 - a^2} = \frac{1}{2a} \ln \left| \frac{x - a}{x + a} \right| \quad (a \neq 0)$$

$$\int \frac{dx}{\sqrt{a^2 - x^2}} = \arcsin \frac{x}{a} \quad (a > 0)$$

$$\int \frac{dx}{\sqrt{x^2 + k}} = \ln \left| x + \sqrt{x^2 + k} \right| \quad (k \neq 0)$$

## C. Some special integrals

$\int R\left(x, \sqrt[s]{\frac{ax+b}{cx+d}}\right) dx$ ............... ..................... substitution: $t = \sqrt[s]{\frac{ax+b}{cx+d}}$

$\int R\left(x, \sqrt{a^2 - x^2}\right) dx$ ............... ..................... substitution: $x = a \sin t$ (or $x = a \cos t$)

$\int R\left(x, \sqrt{x^2 + a^2}\right) dx$ ............... ..................... substitution: $x = a \operatorname{tg} t$ (or $x = a \operatorname{cotg} t$)

$$\int R(\sin x, \cos x)\ dx \ldots \text{ substitution: } \begin{cases} t = \operatorname{tg} \frac{x}{2} & \left(\sin x = \frac{2t}{1+t^2},\ \cos x = \frac{1-t^2}{1+t^2},\ dx = \frac{2\ dt}{1+t^2}\right) \\ t = \sin x & \\ t = \cos x & \\ t = \operatorname{tg} x & \left(\sin^2 x = \frac{t^2}{1+t^2},\ \cos^2 x = \frac{1}{1+t^2},\ dx = \frac{dt}{1+t^2}\right) \end{cases}$$

## D. Some applications of the definite integral in geometry and physics

Length of graph of a function.................... .......................... $s = \int_a^b \sqrt{1 + [f'(x)]^2}\ dx$

Volume of a solid of revolution.................. ....... $V_x = \pi \int_a^b f^2(x)\ dx$, $V_y = 2\pi \int_a^b x f(x)\ dx$

Static moments of a curvilinear trapezoid................. $S_x = \frac{1}{2} \int_a^b f^2(x)\ dx$, $S_y = \int_a^b x f(x)\ dx$

Center of gravity of a curvilinear trapezoid................ $T = \left[\frac{S_y}{m}, \frac{S_x}{m}\right]$, where $m = \int_a^b f(x)\ dx$

# Good Luck !