EXCERCISES – VOCABULARY

I. Read the following numbers:

25; 19; 9; 2,279; 103; 1,000,000; 14; 40; 104; 138; 500; 44,005; 2,004; 836; 1,017; 6,000; 82,985; 10,000,000; 200,000; 15; 50; 629; 2,102; 12; 17; 70; 708; 7,008; 1,825; 1,901; 348; 990; 3,000; 8,000,000; 1,621; 3,508; 3,528; 3,500; 180; 18; 6,213; 963; 2,000,000,000; 1,526

II. Read:

a) $2+5=$; $10+8=$; $25+15=$; $78+7=$; $49+9=$; $99+1=$; $129+37=$; $371+371=$; $a+b$; $-x+1$; $x+y$; $1+y$

b) $19-7=$; $23-9=$; $91-18=$; $11-3=$; $20-10=$; $150-100=$; $1050-85=$; $5{,}000-3{,}000=$; $a-x$; $x-1$; $a-b$

c) $5.5=$; $3.8=$; $7.7=$; $4.12=$; $13.10=$; $6.9=$; $ab=0$; $xy=z$; $2ab$

d) $9:3=$; $5:1=$; $21:7=$; $27:9=$; $35:5=$; $100:10=$; $48:12=$; $75:15=$; $a:b=x$; $X:Z=y$

e) $\frac{2}{3}$; $\frac{4}{7}$; $\frac{1}{2}$; $\frac{3}{4}$; $\frac{1}{10}$; $\frac{5}{100}$; $\frac{3}{1000}$; $\frac{6}{21}$; $\frac{4}{3}$; $\frac{5}{2}$; $\frac{a}{b}$; $\frac{b^2}{c}$; $\frac{\alpha}{y}$; $\frac{\pi}{2}$; $\frac{1}{x}$; $\frac{x}{2}$; $\frac{1}{\sqrt{x}}$; $\frac{c+d}{c-d}$

f) 0.1; .1; .002; 0.003; .2334; 5.1; 7.99; 10.5; 100.25

g) 2^2; 2^3; a^2; a^{-2}; a^3; a^{-3}; $(x^2+y^2)=z$; a^2+b^2; $(a+b)^3$; $(a+b)^m$; $a^n a^m$; $a^m \cdot a^n = a^{m+n}$; $\frac{1}{a^n}=a^{-n}$; $\frac{a^m}{a^n}=a^{m-n}$; $(a^m)^n=a^{mn}$; $\left(\frac{a}{b}\right)^m=\frac{a^m}{b^m}$; $(a+b)^{-1}$; x^{-1}; $a^{1/3}$; $a^{-1/3}$; a^x; $a^{1/x}$; $a^{-1/x}$; $(a^{2/3})^x$

h) $\sqrt{x}$; $\sqrt[3]{a}$; $\sqrt[4]{x+1}$; $\sqrt[n]{y}$; $\sqrt[-2]{a}$; $\sqrt[-3]{x}$; $\sqrt[n]{a^n}\cdot a$; $\sqrt[n]{a}=a^{1/n}$; $\sqrt[m]{a^n}=(\sqrt[m]{a})^n=a^{n/m}$; $\sqrt[n]{\frac{1}{a}}=\frac{1}{\sqrt[n]{a}}=a^{1/n}$; $\sqrt[n]{ab}=\sqrt[n]{a}\cdot\sqrt[n]{b}$; $a\sqrt[n]{b}=\sqrt[n]{a^n b}$; $\sqrt[n]{0}=0$

III. Read the following signs:

0; $+$; $-$; $\pm$; $a\cdot b$; $a:b$; $x:y=a:b$; $=$; $\equiv$; $\neq$; $\approx$; $\doteq$; $a>b$; $b<a$; $a \ngtr b$; $y \nless x$; $(\ \ )$; $[\ \ ]$; $\tilde{a}$; a^*; $\bar{a}$; $\bar{\bar{a}}$; a^{**}; a'; a''; a_n; x_1; y_2; $|a|$; $n!$; $\rightarrow$; $\rightrightarrows$; X; a; $\int$; $\iint$; ∞

IV. Read the following letters of Greek alphabet, giving their Czech names:

α; β; γ; σ; ω; Δ; δ; ϑ; λ; φ; μ; ν; ρ; η; ε; τ; χ; ψ; κ; ζ; ξ; υ; o; Σ; Π; Ω

V. Read the words and pay attention to their stress - if necessary, use a dictionary.

a) different, difference, differentiate, differential, differentiation
b) add, addition additional, additionally
c) subtract, subtraction
d) multiply, multiplication, multiple
e) divide, division
f) integrate, integration, integral
g) derive, derivation, derivative

VI. Say in Czech.

a) equation, expression, formula, theorem, proof, quantity, constant, variable, value, property, relation
b) accordingly, hence, thence, whence
c) let us assume that…; let a – b; let P denote…; let Equation 1 denote…; according to Eq. 2; let a = b
d) the equation is valid for…; (b) is true, if…; Eq. 5 holds for…; the relation applies for all values of…
e) Eq. 1 may be expressed as…; we can express Eq. 1 as …; Eq. 3 may be written in the form…; P can be written as…; the following equation may be put as…

VII. Say in English.

rovnice, sčítání, odčítání, násobení, dělení, výsledek, mocnění, mocnina, index, odmocňování, lomeno, funkce, matematická analýza, derivování, derivovat, odvodit, diferenciál, integrál, integrování, sčítat, odčítat, násobeno 5, děleno 5, umocnit na druhou, umocnit na třetí, integrovat, odmocňovat

VIII. Read and practise reading mathematical expressions.

DIFFERENTIALS

For a system having one independent property which we shall denote by x, let P denote a dependent property,

$$P = P(x)\ ,$$

and ΔP denote the change of P in a change of state from a state 0. According to Taylor´s theorem, we may express ΔP in the form

$$\Delta P = \frac{1}{1!}\left(\frac{dP}{dx}\right)\Delta x + \frac{1}{2!}\left(\frac{d^2P}{dx^2}\right)\Delta x^2 + \qquad (1)$$

Where $\left(\frac{dP}{dx}\right)$, $\left(\frac{d^2P}{dx^2}\right)$, … are the derivatives of P with respect to x evaluated at state 0, and Δx the change of x in the change of state under consideration.

Equation (1) may be written in the form

$$\Delta P = \left(\frac{dP}{dx}\right)\Delta x + R \quad , \qquad (2)$$

Where R is a quantity for which

$$\lim_{\Delta x \to 0}\left(\frac{R}{\Delta x}\right) = 0\ . \qquad (3)$$

As in the differential calculus, we shall denote the quantity $\left(\frac{dP}{dx}\right)\Delta x$ by dP and we will call it the differential of P. Thus

$$dP \equiv \left(\frac{dP}{dx}\right)\Delta x\ . \qquad (4)$$

This expression defines the differential of a dependent property. Differentials may be used in algebraic relations only if the relation applies for all values of Δx . For example the relation

$$dP = 0$$

implies

$$\left(\frac{dP}{dx}\right) = 0\ .$$

Similarly, the relationship

$$dN = dM$$

Between the differentials of dependent properties N and M implies

$$\left(\frac{dN}{dx}\right) = \left(\frac{dM}{dx}\right),$$

Whereas the relationship

$$dN = (dM)^2 \tag{a}$$

Implies

$$\left(\frac{dN}{dx}\right) = 0 = \left(\frac{dM}{dx}\right). \tag{b}$$

For, (a) can be written as

$$\left(\frac{dN}{dx}\right)\Delta x = \left(\frac{dM}{dx}\right)^2 (\Delta x)^2$$

Which is valid for all values of Δx only if (b) is true. It follows that a relationship between differentials of dependent properties is merely a representation of a relationship between derivatives.

The change Δx of the independent variable x during any change of state is also called the differential of x and it is denoted by dx. Hence

$$dx \equiv \Delta x\ . \tag{5}$$

Accordingly, we may write for the differential dP of P

$$dP = \left(\frac{dP}{dx}\right)\Delta x = \left(\frac{dP}{dx}\right) dx\ .$$

The above definitions can be generalized to systems of many independent variable. Accordingly, the differential dP of a property of a system having independent properties x_1, x_2, …, x_n is defined by the relationship

$$dP \equiv \left(\frac{\partial P}{\partial x_1}\right) dx_1 + \left(\frac{\partial P}{\partial x_2}\right) dx_2 - \cdots + \left(\frac{\partial P}{\partial x_n}\right)_{x_i} dx_n$$

where (6)

$$dx_1 \equiv \Delta x_1, dx_2 \equiv \Delta x_2, \ldots, dx_n \equiv \Delta x_n\ ,$$

and $(\partial P/\partial x_k)x_1$ is the partial derivative of P with respect to x_k , holding all other independent properties x_i $(i \neq k)$ constant.

IX. Fill in the missing words – each word can be used only once.

Sum, number, calculus, infinite, techniques, branch, theorems, differential, limit, concept, applying, subdivision, variable, zero, operations, differentiation, integration

The branch of mathematics referred to as calculus (or the ……………………) is customarily divided into two main parts, i.e. …………………… and integral calculus, although the techniques of calculus also involve work with …………………… sequences and series. In fact, calculus is merely a part of a larger …………………… of mathematics that uses the same …………………… . This …………………… of mathematics is usually called analysis. The major …………………… of calculus and the techniques for …………………… its operations to problem solving are based on the concept of …………………… . The limit …………………… is basic to the development of the two main …………………… of the calculus that are not found in more elementary mathematics, namely differentiation and …………………… . In general, …………………… is used to determine the instantaneous rate of change in one …………………… with respect to another; that is, the limit of the rate of change as the time of the change approaches …………………… . Similarly, integration is used to obtain an exact sum of an infinite …………………… of parts; that is, the limit of the …………………… as the number of parts increases without bound.