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数式等の英語での読みについて(その 2)

前回と同じ趣旨で数式等の英文での表現を纏めてみました。
参考テキストや数式等の出典は稿末記載の通りで、今回は主に数研出版 2011～12 入試問題集 数学Ⅰ・Ⅱ・A・B の領域から数と式、関数と方程式・不等式、式と証明、場合の数、三角比・三角関数、指数関数・対数関数とそれらの応用の分野の公式や代表的な数式、方程式等を選び纏めたものです。問題としても 2-(1),(6)　3-(2)　5-(1)は面白く感じました。
興味のある方はチャレンジしてみては如何でしょう。
なお、十分に気をつけ訳した積りですが、誤りの節はご容赦ください。また表現は必ずしも一通りではなく、いくつかありますが本稿では記載分に限定させていただきます。
また本稿の読みは式と対照して考えるべきと思います。

１．数と式

(1) $\sqrt{9x^2+36x+36}-\sqrt{4x^2-8x+4}=3|x+2|-2|x-1|$　　(愛知大、2011 改題)

$=-x-8\ (x<-5)$　　$=5x+4\ (-1<x<1)$

The square root of nine x squared plus thirty-six x plus thirty-six minus the square root of four x squared minus eight x plus four equals three times the absolute value of x plus two minus two times the absolute value of x minus one equals
minus x minus eight, for x is less than minus five.
five x plus four, for x is between minus one and one.

(2) $\sqrt[3]{5\sqrt{2}+7}-\sqrt[3]{5\sqrt{2}-7}=2$　　(愛知教育大(後期)、2011 改題)

The cube root of five times the square root of two, the radicand plus seven minus the cube root of five times the square root of two, the radicand minus seven equals two.

(3) $\dfrac{4}{1-x^4}=\dfrac{1}{1-x}+\dfrac{1}{1+x}+\dfrac{2}{1+x^2}$　(自治医大・医、2012 改題)

Four over one minus x to the four equals one over one minus x plus one over one plus x plus two over one plus x squared.

(4) $a^3\pm b^3=(a\pm b)(a^2\mp ab+b^2)$（複号同順）　$x^4+x^2+1=(x^2+x+1)(x^2-x+1)$

・a cubed plus or minus b cubed equals a plus or minus b times a squared minus or plus $a\ b$ plus b squared, respectively.

・x to the four plus x squared plus one equals x squared plus x plus one times x squared minus x plus one. (いずれも公式)

2. 関数と方程式・不等式

(1) $f(x+y)=3f(x)f(y)$ $x,y>0$ 任意の実数 $f(x),f(y),f(x+y)>0$ で $f(1)=2$ のとき $f(2)$、$f(\frac{3}{2})$ を求めよ。 (星薬科大、2011)

f of x plus y equals three f of x times f of y, x y optional and real number. f of x, f of y, f of x plus y positive respectively and that f of one equals two. In this case, calculate f of two and f of three-seconds.

(2) $x^3-2x^2-3x+10=0$ (福岡大 理 2012 改題)

x cubed minus two x squared minus three x plus ten equals zero.

(3) $3^{2x-1}>\left(\frac{1}{9}\right)^x$ (神奈川大 理・工 2012)

Three to the two x minus one is greater than one- ninths to the x.

(4) $\log_2\frac{x}{4^3}+\log_x 4^4>0,(x>1)$ (徳島大 総合化学 2012)

Log the base two of x over four to the three plus log the base x of four to the four is greater than zero, for x is greater than one.

(5) $2x^2+4xy+3y^2+4x+5y-4=0$ この時 x のとりうる最大の値は？ (東京大・ 文系 2012)

Two x squared plus four x y plus three y squared plus four x plus five y minus four equals zero. In this case, calculate the maximum value of x.

(6) $4^x-4\cdot2^x+9^y-2\cdot3^y\le-1$ のとき、2^x+3^y のとりうる範囲を求めよ。 (東北大 経・ 理(後期) 2012)

x y satisfies " Four to the x minus four times two to the x plus nine to the y minus two times three to the y is less than or equal to minus one ".
In this case, calculate the range that two to the x plus three to the y takes on.

3. 式と証明

(1) $\sqrt{x^2+y^2}\le|x|+2|y|\le\sqrt{5}\sqrt{x^2+y^2}$ (x y は任意の実数)

を証明せよ。 (愛知大 2011)

The absolute value of x plus two times the absolute value of y is greater than or equal to the square root of x squared plus y squared and less than or equal to the square root of five times the square root of x squared plus y squared, x y optional real number. Prove this inequality.

(2) a,b,c,d,x は実数、次の不等式を証明せよ。(富山県立大　工(推薦) 2012)

$$(a^2+b^2+1)x^2-2(ac+bd+1)x+c^2+d^2+1\geq 0$$

Prove the following inequality, where a,b,c,d,x real number respectively. Parentheses a squared plus b squared plus one close parentheses times x squared minus two times parentheses a c plus b d plus one close parentheses times x plus c squared plus d squared plus one is greater than or equal to zero.

4. 場合の数, 二項定理(いずれも公式)

(1) $P_r^n = n(n-1)\cdot\cdot\cdot(n-r+1)=\dfrac{n!}{(n-r)!}$

The permutations n r equals n times n minus one times, and so on, times n minus r plus one, equals n factorial over n minus r factorial.

(2) $C_r^n=\dfrac{P_r^n}{r!}=\dfrac{n!}{r!(n-r)!}$

The combinations n r equals the permutations n r over r factorial, equals n factorial over r factorial times n minus r factorial.

(3) $(a+b)^n=\sum_{r=0}^{n}C_r^n a^{n-r}b^r$

a plus b to the n equals the sum from r equals zero to n of the combinatios n r times a to the n minus r times b to the r.

(4) $E(X)=\sum_{k=1}^{n}x_k p_k$

The expectations of X equals the sum from k equals one to n of x sub k times p sub k.

5. 三角比、三角関数

(1) $\sin^3 x+\sin^3 y=\dfrac{3\sqrt{5}}{32}$, $\dfrac{\sin y}{\sin x}+\dfrac{\sin x}{\sin y}=3$ $\left(-\dfrac{\pi}{2}<x<\dfrac{\pi}{2},\ -\dfrac{\pi}{2}<y<\dfrac{\pi}{2},\right.$ $x\neq 0$, $y\neq 0$) のとき、$x+y$ の値を求めよ。(2011 大阪大 理・工・基礎工(後期))

Sine cubed x plus sine cubed y equals three times the square root of five over thirty-two , sine y over sine x plus sine x over sine y equals three.

x , y lying between minus pi over two and pi over two, respectively.
In this case, calculate the value of x plus y .

(2) ① $\dfrac{a}{\sin A}=\dfrac{b}{\sin B}=\dfrac{c}{\sin C}$ ② $a^2=b^2+c^2-2bc\cos A$

③ $\sin^2 A+\cos^2 A=1$ ④ $\sin A+\sin B=2\sin\dfrac{A+B}{2}\cos\dfrac{A-B}{2}$

⑤ $S=\sqrt{s(s-a)(s-b)(s-c)}$ 但し $s=(a+b+c)/2$

⑥ $a\sin\theta+b\cos\theta=\sqrt{a^2+b^2}\sin(\theta+\alpha)$

但し $\sin\alpha=\dfrac{b}{\sqrt{a^2+b^2}}$ $\cos\alpha=\dfrac{a}{\sqrt{a^2+b^2}}$ ～①～⑥ いずれも公式～

(2) ① a over sine A equals b over sine B , equals c over sine C .

② a squared equals b squared plus c squared minus two b c cosine A .

③ Sine squared A plus cosine squared B equals one.

④ Sine A plus sine B equals two sine of A plus B over two times cosine of A minus B over two.

⑤ S equals the square root of s times s minus a times s minus b times s minus c , where s equals a plus b plus c over two.

⑥ a sine theta plus b cosine theta equals the square root of a squared plus b squared times sine of theta plus alpha, where sine alpha equals b over the square root of a squared plus b squared and cosine alpha equals a over the square root of a squared plus b squared.

(参考文献)
(1) 講談社 ブルーバックス「数学版 これを英語で言えますか？」
保江 邦夫著、エドワード・ネルソン監修
(2) 数研出版 2011～2012 入試問題集 数学Ⅰ・Ⅱ・A・B(理系)