수식 표현 실습 Part I

권현우

서강대학교 수학과 / KTUG

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수식의 종류

- 행중 수식(inline style) $\int_a^b f(x)\,dx$
- 별행 수식(display style)

$$\int_a^b f(x)\,dx$$

$$\int_a^b f(x)\,dx \tag{1}$$

```
$\int_a^b f(x) dx$

\[  \int_a^b f(x) dx \]
\begin{equation}
\int_a^b f(x) dx
\end{equation}
```

숫자 쓰기

$-5, 9, 0.666, \sqrt{2}, \pi, \sqrt[3]{-32}, i$

$$-5, 9, 0.666, \sqrt{2}, \pi, \sqrt[3]{-32}, i$$

```
\documentclass{article}


\begin{document}
$-5, 9, 0.666, \sqrt{2}, \pi, \sqrt[3]{-32}, i$

\[  -5, 9, 0.666, \sqrt{2}, \pi, \sqrt[3]{-32}, i \]
\end{document}
```

연산

더하기, 빼기, 곱하기, 나누기

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a-b)^2 = a^2 - 2ab + b^2$$

$$(a+b) \times (c+d) = a \times c + a \times d + b \times c + b \times d$$

$$a \div b = q \quad \cdots r$$

```
\[
(a+b)^2 = a^2 + 2ab + b^2
\]
\[
(a-b)^2 = a^2 - 2ab + b^2
\]
\[
(a+b)\times (c+d) = a\times c + a\times d + b\times c+ b\times d
\]
\[
a \div b = q \quad\cdots r
\]
```

연산

분수, 지수, 제곱근

$$\frac{355}{113}, \quad a^{n+1}, 2^{2^{2^2}} \quad \sqrt{2}, \sqrt[3]{2}, \sqrt{\sqrt{\sqrt{2}}}$$

$$2 + \cfrac{1}{2 + \cfrac{1}{3 + \frac{1}{2}}}$$

```
\[
\frac{355}{113},\quad a^{n+1}, 2^{2^{2^2}}\quad \sqrt{2}, \sqrt[3]{2},
↪  \sqrt{\sqrt{\sqrt{2}}}
\]
\[
2+\cfrac1{2+\cfrac1{3+\frac{1}{2}}}
\]
```

연산

괄호

$$10 \div [\{5 \times (2+3)\} - 20]$$

$$\left[\frac{\pi}{2}, \infty\right)$$

```
\[
10 \div \left[ \left\{ 5 \times \left( 2+3 \right) \right\} - 20 \right]
\]
\[
\left[\frac{\pi}{2}, \infty\right)
\]
```

집합 기호

$$\mathbb{N}, \mathbb{Z}, \mathbb{R}$$

$$x \in \mathbb{R} \setminus \{0\}, \qquad \emptyset, \varnothing$$

```
\usepackage{amssymb}
...

\[
\mathbb{N}, \mathbb{Z}, \mathbb{R}
\]
\[
x \in \mathbb{R}\setminus\{0\}, \qquad \emptyset, \varnothing
\]
```

위첨자와 아래첨자 그리고 underbrace

$$a^m a^n = a^{m+n}$$

$$a_{n+1} = a_n + d$$

$$a^n = \underbrace{a \times a \times \cdots \times a}_{n}$$

```
$a^ma^n = a^{m+n}$

$a_{n+1} = a_n + d$

$a^n = \underbrace{a \times a\times \cdots \times a }_{n}$
```

위첨자와 괄호

$$\left(f^{-1} \circ g^{-1} \right) (1)$$

```
\[
\left( f^{-1} \circ g^{-1} \right) (1)
\]
```

수식환경

$$\begin{aligned}
\frac{12 a^3 b^{-4}}{4a^2 b} &= \frac{12 a^3\cdot a^2 } {4b \cdot b^4} \\
&= \frac{3a^4}{b^5}
\end{aligned}$$

```
\[
\begin{aligned}
\frac{12 a^3 b^{-4}}{4a^2 b} &= \frac{12 a^3\cdot a^2 } {4b \cdot b^4} \\
&= \frac{3a^4}{b^5}
\end{aligned}
\]
```

cases 환경과 brace

$$\left\vert a\right\vert = \begin{cases} a, & a \ge 0 \\ -a, & a < 0. \end{cases}$$

$$\left\{ \begin{aligned} & ax + by = p \\ & cx + dy = q \end{aligned} \right.$$

```
\[
\left\vert a\right\vert = \begin{cases}
        a, & a \ge 0 \\
        -a, & a < 0 .
        \end{cases}
\]

\[
\left\{
\begin{aligned}
& ax + by = p \\
& cx + dy = q
\end{aligned} \right.
\]
```

수식환경

$$ax^2 + bx + c = 0 \ (a \neq 0)$$
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

```
\usepackage{mathtools,amssymb} %mathtools: amsmath 확장판
...

\[
\begin{aligned}
&ax^2 + bx + c = 0 \:\: (a\neq 0 ) \\
& x= \frac{-b \pm\sqrt{b^2-4ac}}{2a}
\end{aligned}
\]
```

- align,aligned,alignedat, ...

수식환경

$$ax^2 + bx + c = 0 \ \ (a \neq 0)$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

수식환경에서 띄어쓰기를 하려면

`\,` `\:`, `\quad`, `\qquad`, `\hspace{`길이단위`}`

지수함수와 로그함수

$$\log_a b = \frac{\log_c b}{\log_c a}$$

$$\ln x = -\frac{1}{2}$$

$$e^{\ln x} = e^{-1/2}$$

```
\[
\log_a b = \frac{ \log_c b } { \log_c a }
\]
\[
\begin{aligned}
\ln x &= -\frac12 \\
e^{\ln x} &= e^{-1/2}
\end{aligned}
\]
```

삼각함수

$$\begin{aligned}\sin x &= \sum_{n=0}^{\infty} \frac{(-1)^n}{2n+1} x^{2n+1} \\ &= x - \frac{x^3}{3!} + \frac{x^5}{5!} + \cdots\end{aligned}$$

```
\[
\begin{split}
\sin x &= \sum_{n=0}^{\infty} \frac{(-1)^n}{2n+1} x^{2n+1}  \\
&= x- \frac{x^3}{3!}+\frac{x^5}{5!}+\cdots
\end{split}
\]
```

벡터기호와 노름

$$\|\overrightarrow{PQ}\| = \sqrt{(a-x)^2+(b-y)^2}$$

$$\mathbf{w}_1 = \operatorname{proj}_{\mathbf{v}}\,\mathbf{u} = \left(\frac{\mathbf{u}\cdot\mathbf{v}}{\|\mathbf{v}\|^2}\right)\mathbf{v}$$

```
\[
\| \overrightarrow{PQ} \| = \sqrt{(a-x)^2+(b-y)^2}
\]

\[
\mathbf{w}_1 = \operatorname{proj}_\mathbf{v} \mathbf{u} =
↪  \left(\frac{\mathbf{u}\cdot \mathbf{v}}{\|\mathbf{v}\|^2} \right)
↪  \mathbf{v}
\]
```

행렬과 조합기호

$$\det(A) = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

```
\[
\det(A) = \begin{vmatrix}
a & b \\
c & d
\end{vmatrix}
= ad -bc
\]
```

미분과 적분

$$f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$$

$$\int_a^b f(x)\,dx = \lim_{n\to\infty} \sum_{k=1}^{n} f(x_k)\Delta x \quad \left(\text{단, } x_k = a + k\Delta x,\ \Delta x = \frac{b-a}{n} \right).$$

```
\[
f'(x) = \lim_{\Delta x\to 0 } \frac{ f(x + \Delta x) - f(x) } { \Delta x }
\]

\[
\int_a^b f(x)\,dx = \lim_{n\to\infty}\sum_{k=1}^n f(x_k) \Delta x \quad
↪  \left(\text{단,}\; x_k = a+k\Delta x, \, \Delta x = \frac{b-a}{n} \right).
\]
```

미분과 적분

$$\begin{aligned}
\int e^x \cos x \, dx &= e^x \cos x + \int e^x \sin x \, dx \\
&= e^x \cos x + e^x \sin x - \int e^x \cos x \, dx \\
&= \frac{e^x (\sin x + \cos x)}{2} + C
\end{aligned}$$

```
\[
\begin{aligned}
\int e^x \cos x \,dx &= e^x \cos x + \int e^x \sin x \,dx \\
&= e^x \cos x + e^x \sin x - \int e^x \cos x \,dx \\
&= \frac { e^x (\sin x + \cos x ) } { 2 } + C
\end{aligned}
\]
```