Lecture 2 Notes

Inline math vs. Display math:

Differences between inline math $\sum_{k=1}^{n}$, $\int_{10}^{20} f(x)\,dx$, $\frac{1}{x}$ and display math

$$\sum_{k=1}^{n}$$

$$\int_{10}^{20} f(x)\,dx$$

$$\frac{1}{x}$$

\displaystyle command:

Compare the differences between $f(x) = \frac{1}{1+x^2}$ and $f(x) = \dfrac{1}{1+x^2}$

User-defined new command:

Same outputs for $\dfrac{1}{1+x^2}$ and $\dfrac{1}{1+x^2}$.

Same outputs for $\sqrt[3]{x}$ and $\sqrt[3]{x}$.

Fitting bracket size:

$$(\frac{1}{1+x^2})^3$$

$$\left(\frac{1}{1+x^2}\right)^3$$

$$\lim_{x\to 0}\left(\frac{\sin x}{x}\right)^3 = 1$$

$$\left|\frac{1-i}{1+i}\right|$$

Equation & Eqnarray:

$$x + \sin x = x^2 \tag{1}$$

$$\frac{dy}{dx} = \tan x \tag{2}$$

$$\sqrt[3]{x} + \log_2 x = \pi \tag{3}$$

$$\begin{aligned} x + \sin x &= x^2 && (4)\\ \frac{dy}{dx} &= \tan x && (5)\\ \sqrt[3]{x} + \log_2 x &= \pi && (6) \end{aligned}$$

$$\begin{aligned} (1+x)^4 &= (1+x)^2 \cdot (1+x)^2 && (7)\\ &= (1+2x+x^2) \cdot (1+2x+x^2) && (8)\\ &= 1+4x+6x^2+4x^3+x^4 && (9) \end{aligned}$$

$$\begin{aligned} & (1+x)^4 && (10)\\ = \; & (1+x)^2 \cdot (1+x)^2 && (11)\\ = \; & (1+2x+x^2) \cdot (1+2x+x^2) && (12)\\ = \; & \cdots && (13) \end{aligned}$$

Suppressing Equation Numbers:

$$\sin 2\theta = 2 \sin \theta \cos \theta$$

$$\begin{aligned} (1+x)^4 &= (1+x)^2 \cdot (1+x)^2\\ &= (1+2x+x^2) \cdot (1+2x+x^2)\\ &= 1+4x+6x^2+4x^3+x^4 \end{aligned}$$

$$\begin{aligned} (1+x)^4 &= (1+x)^2 \cdot (1+x)^2\\ &= (1+2x+x^2) \cdot (1+2x+x^2) && (14)\\ &= 1+4x+6x^2+4x^3+x^4 \end{aligned}$$

Arrays:

$$\begin{array}{cc} 12 & 33 \\ 5 & 7 \\ 29 & 11 \end{array}$$

$$\begin{array}{ccc} x^{10} & \cos x & \ln x \\ 10x^9 & -\sin x & \frac{1}{x} \end{array}$$

Matrix:

$$\begin{pmatrix} 12 & 33 \\ 5 & 7 \\ 29 & 11 \end{pmatrix} \qquad \begin{bmatrix} 12 & 33 \\ 5 & 7 \\ 29 & 11 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \Rightarrow \det(A) = 1 \times 4 - 2 \times 3 = -2$$

Piecewise function:

$$|x| = \begin{cases} x & ; \quad x > 0 \\ 0 & ; \quad x = 0 \\ -x & ; \quad x < 0 \end{cases}$$

$$|x| = \begin{cases} x; & x \geq 0 \\ -x; & x < 0 \end{cases}$$

Tabular:

True	False
1	0

$f(x)$	$f'(x)$	$f''(x)$
x^2	$2x$	2
$\sin x$	$\cos x$	$-\sin x$

Table:

Name	Age	Gender	Group
Alice	18	F	C21
Bob	20	M	A29
David	19	M	C25

Table 1: Student list