PL 과제0

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과제 내용

- section 1. 자기소개

- section 2. 조교가 내주는 수식 작성
  - section 2.1 수식의 의미

- section 3. 가장 좋아하는 그림을 문서에 넣기
  - section 3.1 가장 좋아하는 그림의 설명 및 좋아하는 이유 작성

학번 0,1로 끝날시

V EXAMPLE 2 Find the length of the arc of the parabola $y^2 = x$ from $(0, 0)$ to $(1, 1)$.

SOLUTION Since $x = y^2$, we have $dx/dy = 2y$, and Formula 4 gives

$$L = \int_0^1 \sqrt{1 + \left(\frac{dx}{dy}\right)^2}\, dy = \int_0^1 \sqrt{1 + 4y^2}\, dy$$

We make the trigonometric substitution $y = \frac{1}{2}\tan\theta$, which gives $dy = \frac{1}{2}\sec^2\theta\, d\theta$ and $\sqrt{1 + 4y^2} = \sqrt{1 + \tan^2\theta} = \sec\theta$. When $y = 0$, $\tan\theta = 0$, so $\theta = 0$; when $y = 1$, $\tan\theta = 2$, so $\theta = \tan^{-1}2 = \alpha$, say. Thus

$$\begin{aligned} L &= \int_0^\alpha \sec\theta \cdot \tfrac{1}{2}\sec^2\theta\, d\theta = \tfrac{1}{2}\int_0^\alpha \sec^3\theta\, d\theta \\ &= \tfrac{1}{2} \cdot \tfrac{1}{2}\Big[\sec\theta\tan\theta + \ln|\sec\theta + \tan\theta|\Big]_0^\alpha \qquad \text{(from Example 8 in Section 7.2)} \\ &= \tfrac{1}{4}\big(\sec\alpha\tan\alpha + \ln|\sec\alpha + \tan\alpha|\big) \end{aligned}$$

(We could have used Formula 21 in the Table of Integrals.) Since $\tan\alpha = 2$, we have $\sec^2\alpha = 1 + \tan^2\alpha = 5$, so $\sec\alpha = \sqrt{5}$ and

$$L = \frac{\sqrt{5}}{2} + \frac{\ln(\sqrt{5} + 2)}{4}$$

학번 2,3으로 끝날시

$$
\begin{aligned}
& \mathrm{E}\left[X^2\right] \\
&= \sum_{x \in R_X} x^2 p_X(x) \\
&= \sum_{x=0}^{\infty} x^2 \exp(-\lambda) \frac{1}{x!} \lambda^x \\
&= 0 + \sum_{x=1}^{\infty} x^2 \exp(-\lambda) \frac{1}{x!} \lambda^x && \text{(the first term of the sum is zero since } x = 0\text{)} \\
&= \sum_{y=0}^{\infty} (y+1)^2 \exp(-\lambda) \frac{1}{(y+1)!} \lambda^{y+1} && \text{(by changing variable: } y = x - 1\text{)} \\
&= \sum_{y=0}^{\infty} (y+1)^2 \exp(-\lambda) \frac{1}{(y+1)y!} \lambda \lambda^y && \text{(since } (y+1)! = (y+1)y!\text{)} \\
&= \lambda \sum_{y=0}^{\infty} (y+1) \exp(-\lambda) \frac{1}{y!} \lambda^y \\
&= \lambda \sum_{y=0}^{\infty} (y+1) p_Y(y) && \text{(} p_Y \text{ is the pmf of a Poisson r.v. with parameter } \lambda\text{)} \\
&= \lambda \left\{ \sum_{y=0}^{\infty} y p_Y(y) + \sum_{y=0}^{\infty} p_Y(y) \right\} \\
&= \lambda \{\mathrm{E}[Y] + 1\} && \text{(the sum of a pmf over its support is 1)} \\
&= \lambda \{\lambda + 1\} && \text{(expected value of a Poisson r.v. with parameter } \lambda \text{ is } \lambda\text{)} \\
&= \lambda^2 + \lambda
\end{aligned}
$$

$$\mathrm{E}[X]^2 = \lambda^2$$

$$\mathrm{Var}[X] = \mathrm{E}\left[X^2\right] - \mathrm{E}[X]^2 = \lambda^2 + \lambda - \lambda^2 = \lambda$$

학번 4,5로 끝날시

EXAMPLE 4 Find $\int \sin^4 x\, dx$.

SOLUTION We could evaluate this integral using the reduction formula for $\int \sin^n x\, dx$ (Equation 7.1.7) together with Example 3 (as in Exercise 47 in Section 7.1), but a better method is to write $\sin^4 x = (\sin^2 x)^2$ and use a half-angle formula:

$$\begin{aligned}\int \sin^4 x\, dx &= \int (\sin^2 x)^2\, dx \\ &= \int \left(\frac{1 - \cos 2x}{2}\right)^2 dx \\ &= \tfrac{1}{4} \int (1 - 2\cos 2x + \cos^2 2x)\, dx\end{aligned}$$

Since $\cos^2 2x$ occurs, we must use another half-angle formula

$$\cos^2 2x = \tfrac{1}{2}(1 + \cos 4x)$$

This gives

$$\begin{aligned}\int \sin^4 x\, dx &= \tfrac{1}{4} \int \left[1 - 2\cos 2x + \tfrac{1}{2}(1 + \cos 4x)\right] dx \\ &= \tfrac{1}{4} \int \left(\tfrac{3}{2} - 2\cos 2x + \tfrac{1}{2}\cos 4x\right) dx \\ &= \tfrac{1}{4}\left(\tfrac{3}{2}x - \sin 2x + \tfrac{1}{8}\sin 4x\right) + C\end{aligned}$$

학번 6,7로 끝날시

V EXAMPLE 2 Prove that $\lim_{x \to 3} (4x - 5) = 7$.

SOLUTION

1. *Preliminary analysis of the problem (guessing a value for δ).* Let ε be a given positive number. We want to find a number δ such that

$$\text{if} \quad 0 < |x - 3| < \delta \quad \text{then} \quad |(4x - 5) - 7| < \varepsilon$$

But $|(4x - 5) - 7| = |4x - 12| = |4(x - 3)| = 4|x - 3|$. Therefore we want δ such that

$$\text{if} \quad 0 < |x - 3| < \delta \quad \text{then} \quad 4|x - 3| < \varepsilon$$

that is, $$\text{if} \quad 0 < |x - 3| < \delta \quad \text{then} \quad |x - 3| < \frac{\varepsilon}{4}$$

This suggests that we should choose $\delta = \varepsilon/4$.

2. *Proof (showing that this δ works).* Given $\varepsilon > 0$, choose $\delta = \varepsilon/4$. If $0 < |x - 3| < \delta$, then

$$|(4x - 5) - 7| = |4x - 12| = 4|x - 3| < 4\delta = 4\left(\frac{\varepsilon}{4}\right) = \varepsilon$$

Thus

$$\text{if} \quad 0 < |x - 3| < \delta \quad \text{then} \quad |(4x - 5) - 7| < \varepsilon$$

Therefore, by the definition of a limit,

$$\lim_{x \to 3} (4x - 5) = 7$$

This example is illustrated by Figure 9.

학번 8,9로 끝날시

EXAMPLE 4 Prove that $\lim_{x \to 3} x^2 = 9$.

SOLUTION

1. *Guessing a value for δ.* Let $\varepsilon > 0$ be given. We have to find a number $\delta > 0$ such that

$$\text{if} \quad 0 < |x - 3| < \delta \quad \text{then} \quad |x^2 - 9| < \varepsilon$$

To connect $|x^2 - 9|$ with $|x - 3|$ we write $|x^2 - 9| = |(x + 3)(x - 3)|$. Then we want

$$\text{if} \quad 0 < |x - 3| < \delta \quad \text{then} \quad |x + 3||x - 3| < \varepsilon$$

Notice that if we can find a positive constant C such that $|x + 3| < C$, then

$$|x + 3||x - 3| < C|x - 3|$$

and we can make $C|x - 3| < \varepsilon$ by taking $|x - 3| < \varepsilon/C = \delta$.

We can find such a number C if we restrict x to lie in some interval centered at 3. In fact, since we are interested only in values of x that are close to 3, it is reasonable to assume that x is within a distance 1 from 3, that is, $|x - 3| < 1$. Then $2 < x < 4$, so $5 < x + 3 < 7$. Thus we have $|x + 3| < 7$, and so $C = 7$ is a suitable choice for the constant.

But now there are two restrictions on $|x - 3|$, namely

$$|x - 3| < 1 \quad \text{and} \quad |x - 3| < \frac{\varepsilon}{C} = \frac{\varepsilon}{7}$$

To make sure that both of these inequalities are satisfied, we take δ to be the smaller of the two numbers 1 and $\varepsilon/7$. The notation for this is $\delta = \min\{1, \varepsilon/7\}$.

2. *Showing that this δ works.* Given $\varepsilon > 0$, let $\delta = \min\{1, \varepsilon/7\}$. If $0 < |x - 3| < \delta$, then $|x - 3| < 1 \Rightarrow 2 < x < 4 \Rightarrow |x + 3| < 7$ (as in part 1). We also have $|x - 3| < \varepsilon/7$, so

$$|x^2 - 9| = |x + 3||x - 3| < 7 \cdot \frac{\varepsilon}{7} = \varepsilon$$

This shows that $\lim_{x \to 3} x^2 = 9$.

section 3.1 가장 좋아하는 그림의 설명 및 좋아하는 이유 작성

\label{...........} <- Section 3에서 label을 달고

그림 \ref{...........}는 어떠어떠하다. <- Section 3.1에서 \ref을 이용한다.

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\begin{figure}[T]

\centering

\includegraphics[width=\textwidth]{4-1.png}

\caption{

Correlation graph for Cluster 1 for CDY data
\label{fig4-1}

\end{figure}
```

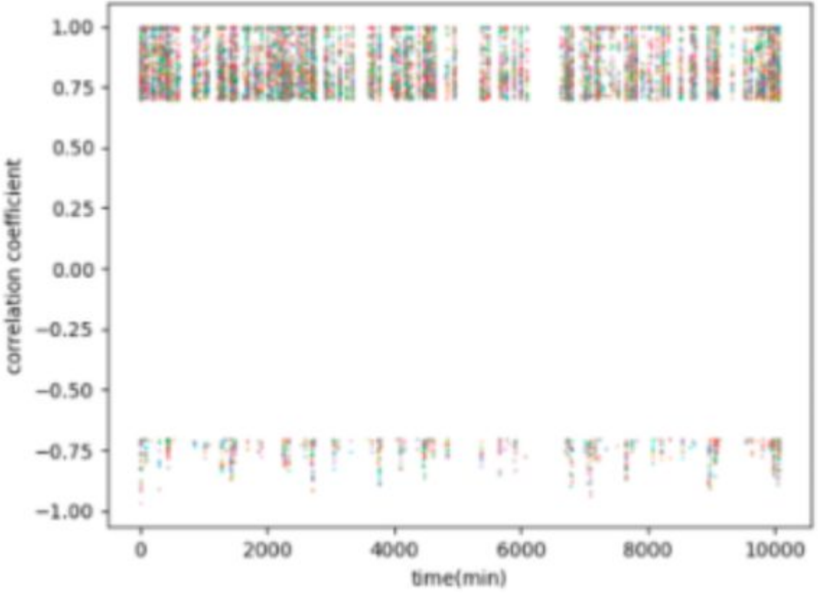

Fig. 3. Correlation graph for Cluster 1 for CDY data of the 1st week

Figure 3 shows a correlation graph based on the time (minute) of the first week of Cluster 1 for CDY data. The horizontal axis shows time in a range of 0 to 10080 minutes, and the vertical axis has a range of –1.0 to 1.0 representing correlation values.

Figure~\ref{fig4-1} shows a correlation graph based on the time (minute) of the first week of Cluster 1 for CDY data.

The horizontal axis shows time in a range of 0 to 10080 minutes, and the vertical axis has a range of –1.0 to 1.0 representing correlation values.

과제 제출

- 2019년 3월 15일 (금) 23시까지
- submit ta_hsc hw0b (2분반)
- submit ta_hsc hw0c (3분반)
- submit ta_hsc hw0d (4분반)

- 제출확인
- submit ta_hsc hw0x -l