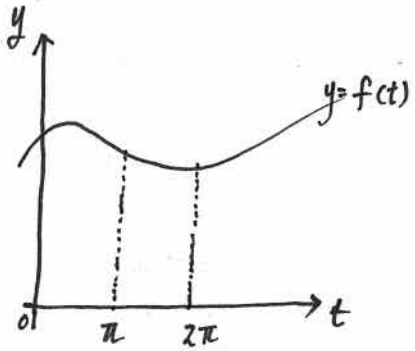
Fundamental Theorem of Calculus.

1. Define a function that is continuous on $[a, b]$.

   What do the brackets '[ ]' signify?

2. Indicate the region on the graph which the following expression ① corresponds to:



$$F(x)=\int_0^x f(t)\,dt \quad \cdots\cdots ①$$

where $x \in [\pi, 2\pi]$

3. Does every continuous function have an antiderivative?

4. How do we (write) express the area under a curve $y=f(t)$ between two end points?

5. Why is the Fundamental Theorem of Calculus important? (What does it tell us?)

6. Please solve.

$$F(x)=\frac{d}{dx}\left(\int_{\sqrt{2}}^{\pi}\left(\frac{\tan^2(t^3)}{e^{-t}}\right)dt\right)$$, then what is $F(2)$?

7. Write an expression for the area under the curve defined by $y = e^{-x}$ in the interval $x \in [1, 3]$.

8. If $\frac{d}{dx}\int_a^x (\cos^2 t - \sqrt{3}t + e^t)\,dt = \frac{d}{dx}\int_b^x (\cos^2 t - \sqrt{3}t + e^t)\,dt$,

what can we say about a and b?

9. What is the next video going to be about?

10. What is another name for definite integral?

Proving Trigonometric formulas using Euler's formula.

1. The lecture proves $\sin^2(x)+\cos^2(x)=1$, using Euler's formula. However, there are other ways to prove the same identity.
Please name one alternative theorem (mentioned in the lecture) that can be used to prove $\sin^2(x)+\cos^2(x)=1$.

2. $e^{i(-x)} = \underbrace{\cos(-x)+i\sin(-x)}_{①} = \underbrace{\cos(x)-i\sin(x)}_{②}$

Why is ① = ② ?

3. If $\cos(2\pi x-3x)+i(3\pi-2y)=\cos(3-2x)+i(y)$, then what is the value of y? (x is a real number).

4. What is the angle sum formula for $\cos(a+b)$?

5. What is the formula for $\sin(2x)$?

6. Explain briefly how to derive the angle sum formulas.

7. What is the Euler's formula for e^{3ix}?

8. The first part of the lecture proves $1=\sin^2 x+\cos^2 x$ ..... ③
What are the <u>two</u> equations that is multiplied to get the <u>Left hand side</u> of ③? (i.e. <u>1</u>)

9. What is the angle sum formula for $\sin(a+b)$?

10. What is the double angle formula for $\cos(2x)$?

Uniform Distribution

1. What is the area under the PDF (probability density function) of a random variable X?

2. What is the PDF of a uniform random variable $X \sim Unif(a,b)$?

3. What is the Expected Value of $X \sim Unif(a,b)$?

4. $M_X(t) = \frac{e^{bt} - e^{at}}{(b-a)t}$ What does M_X stand for in the lecture?

5. For a uniform random variable X with lower limit 2, and upper limit 5, $CDF_X(1) = 0$. (CDF: cumulative distribution function). Why?

6. What is another way of deriving the CDF of a uniform variable X without using integration?

7. For a uniform distribution with minimum 2 and maximum 10, what is the probability that the variable is less than 9?

8. What is the definition of CDF (cumulative distribution function)?

9. The lecture introduced several concepts related to Uniform Distributio and derived the CDF of X. What is the rest of the lesson (which you have not seen) going to be about?

10. What is the variance of the uniform random variable X between a, and b? (i.e. $X = Unif(a,b)$)