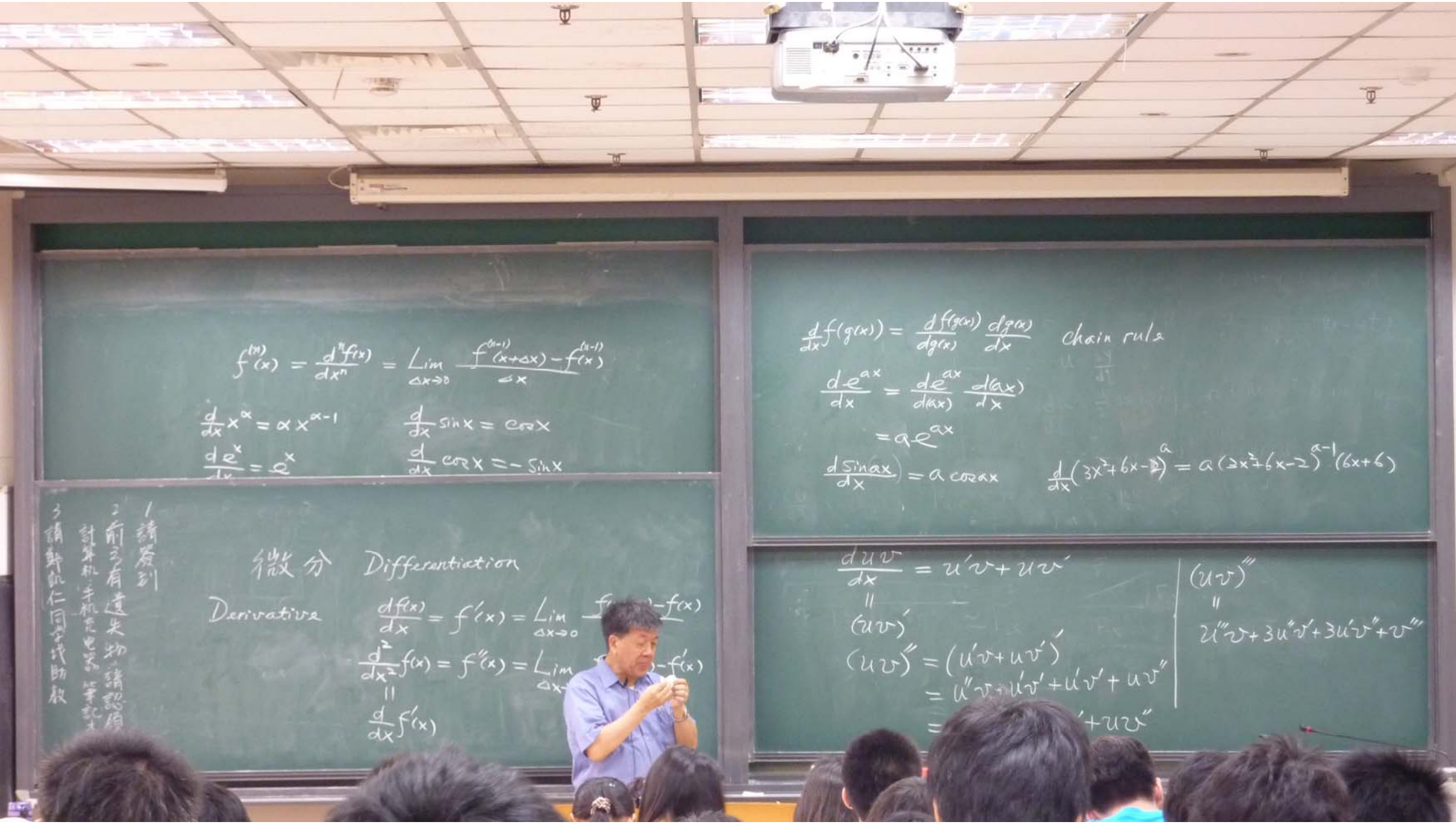
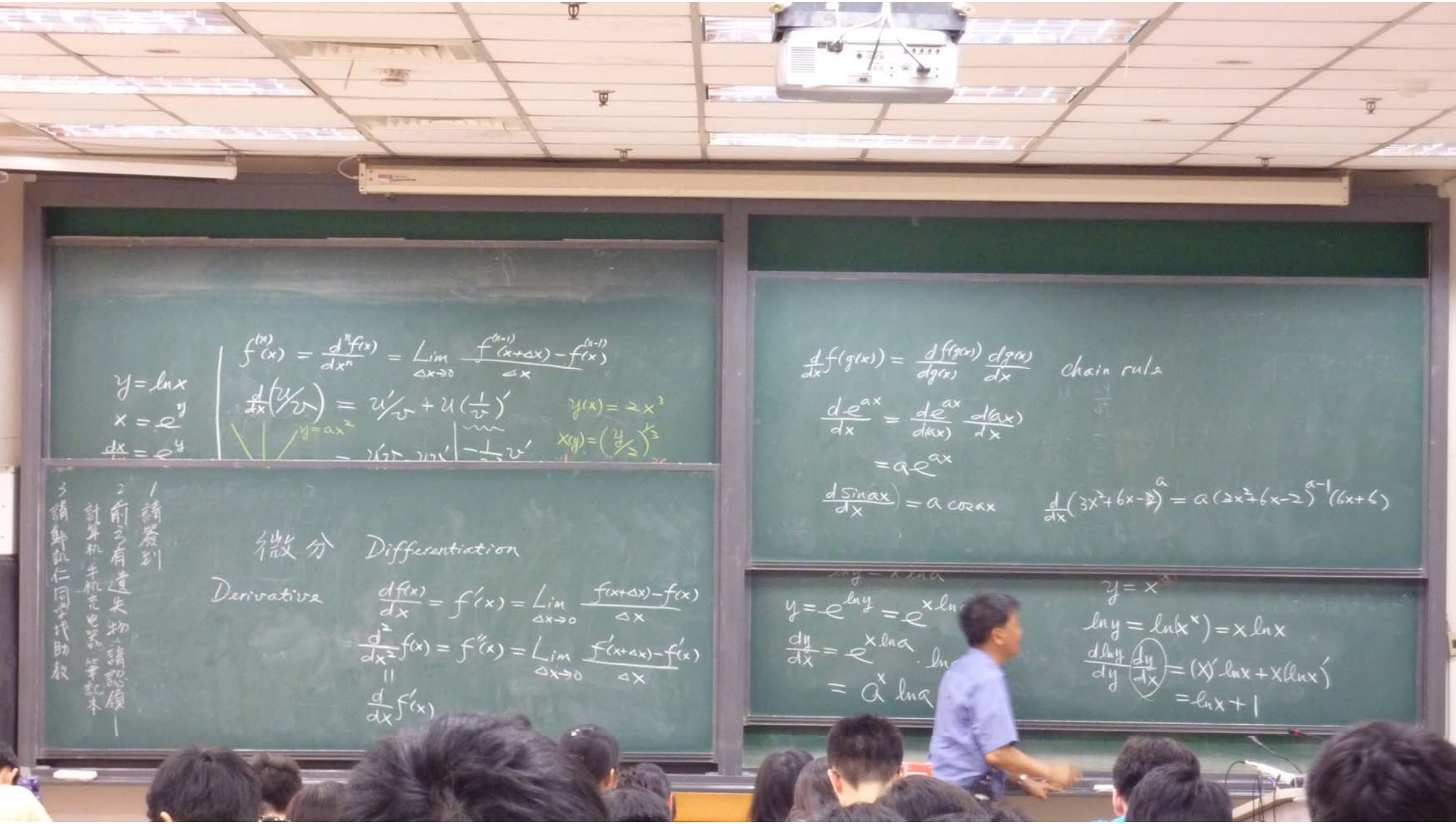
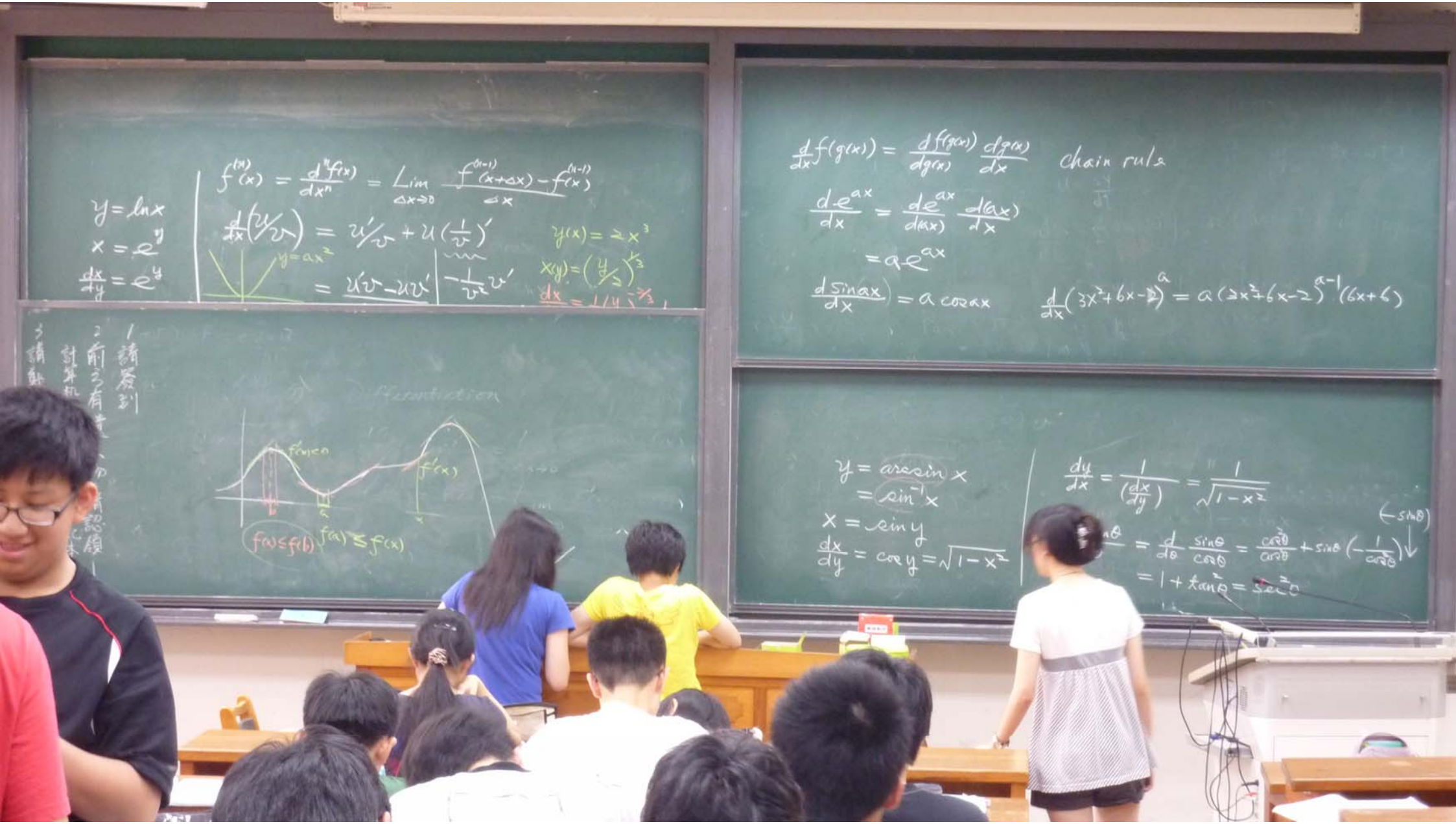

$f^{(n)}(x) = \frac{d^n f(x)}{dx^n} = \lim_{\Delta x \to 0} \frac{f^{(n-1)}(x+\Delta x) - f^{(n-1)}(x)}{\Delta x}$
$\frac{d}{dx} x^\alpha = \alpha x^{\alpha-1}$
$\frac{d}{dx} \sin x = \cos x$
$\frac{de^x}{dx} = e^x$
$\frac{d}{dx} \cos x = -\sin x$
$\frac{df(g(x))}{dx} = \frac{df(g(x))}{dg(x)} \frac{dg(x)}{dx}$ chain rule
$\frac{de^{ax}}{dx} = \frac{de^{ax}}{d(ax)} \frac{d(ax)}{dx}$
$= ae^{ax}$
$\frac{d \sin ax}{dx} = a \cos ax$
$\frac{d}{dx}(3x^2+6x-2)^a = a(3x^2+6x-2)^{a-1}(6x+6)$
微分 Differentiation
Derivative
$\frac{df(x)}{dx} = f'(x) = \lim_{\Delta x \to 0}$
$\frac{d^2}{dx^2} f(x) = f''(x) = \lim_{\Delta x}$
$= \frac{d}{dx} f'(x)$
$\frac{duv}{dx} = u'v + uv'$
$(uv)'$
$(uv)'' = (u'v + uv')'$
$= u''v + u'v' + u'v' + uv''$
$= \quad + uv''$
$(uv)'''$
$u'''v + 3u''v' + 3u'v'' + v'''$
1 請簽到
2 前3有遺失物請認領
計算機 手機先關機 筆記本
3 請幫執仁同學找助教


$y = \ln x$
$x = e^y$
$\frac{dx}{dy} = e^y$
$f^{(n)}(x) = \frac{d^n f(x)}{dx^n} = \lim_{\Delta x \to 0} \frac{f^{(n-1)}(x+\Delta x) - f^{(n-1)}(x)}{\Delta x}$
$\frac{d}{dx}(u/v) = u'/v + u(\frac{1}{v})'$
$y(x) = 2x^3$
$x(y) = (\frac{y}{2})^{\frac{1}{3}}$
$y = ax^2$
$-\frac{1}{v^2}v'$
微分 Differentiation
Derivative
$\frac{df(x)}{dx} = f'(x) = \lim_{\Delta x \to 0} \frac{f(x+\Delta x) - f(x)}{\Delta x}$
$\frac{d^2}{dx^2}f(x) = f''(x) = \lim_{\Delta x \to 0} \frac{f'(x+\Delta x) - f'(x)}{\Delta x}$
$\frac{d}{dx}f'(x)$
1 請簽到
2 前方有遺失物請認領
計算机 手机充电器 笔记本
3 請鄭凱仁同學找助教
$\frac{d}{dx}f(g(x)) = \frac{df(g(x))}{dg(x)}\frac{dg(x)}{dx}$ chain rule
$\frac{de^{ax}}{dx} = \frac{de^{ax}}{d(ax)}\frac{d(ax)}{dx}$
$= ae^{ax}$
$\frac{d\sin ax}{dx} = a\cos ax$
$\frac{d}{dx}(3x^2+6x-2)^a = a(3x^2+6x-2)^{a-1}(6x+6)$
$y = e^{\ln y} = e^{x\ln a}$
$\frac{dy}{dx} = e^{x\ln a}\cdot \ln a$
$= a^x \ln a$
$y = x^x$
$\ln y = \ln(x^x) = x\ln x$
$\frac{d\ln y}{dy}\frac{dy}{dx} = (x)'\ln x + x(\ln x)'$
$= \ln x + 1$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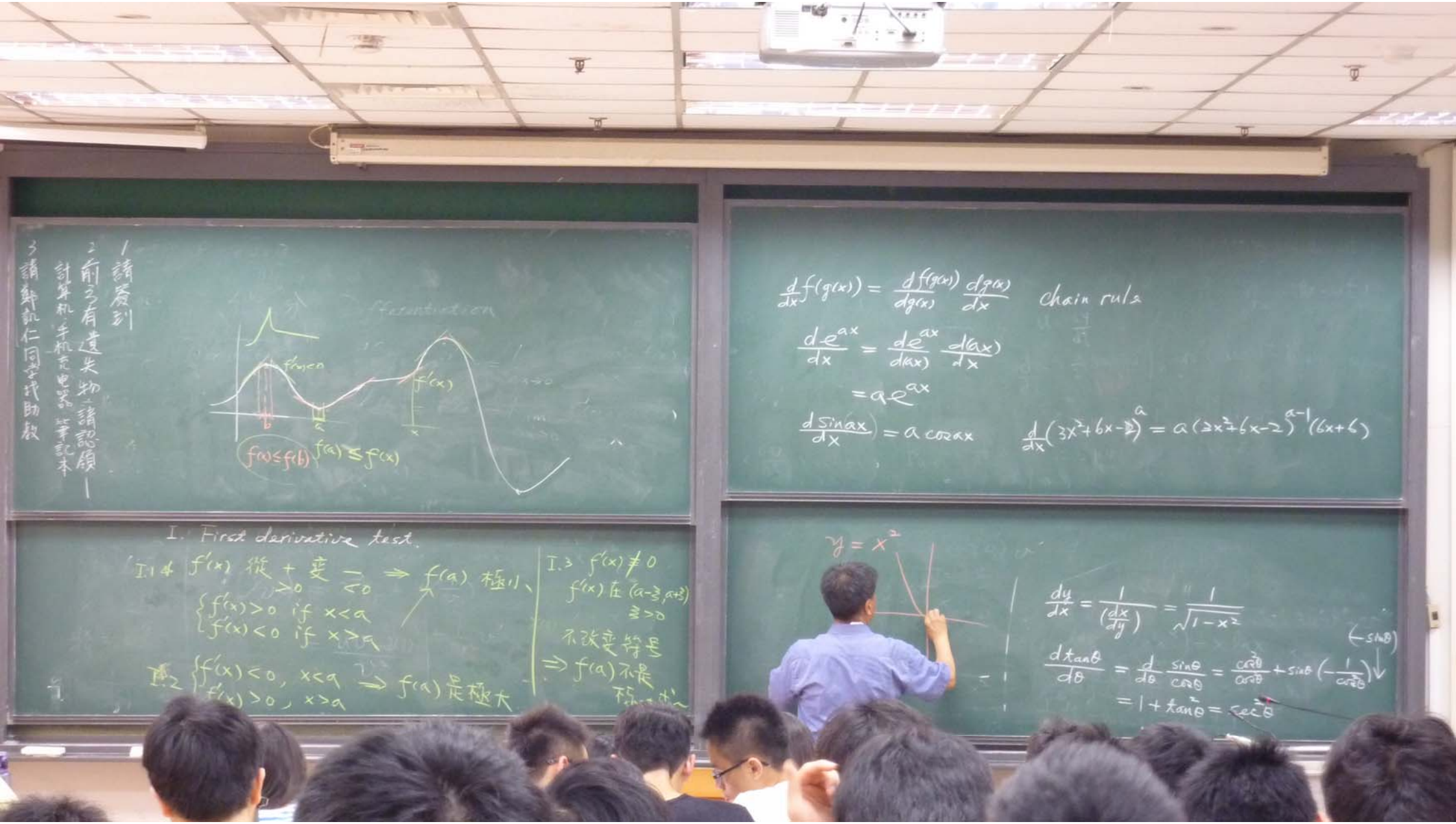
$\frac{d}{dx}(u/v) = u'/v + u(\frac{1}{v})'$
$= \frac{uv - uv'}{v^2}$
$y = ax^2$
$y(x) = 2x^3$
$x(y) = (\frac{y}{2})^{1/3}$
$\frac{dx}{dy} = 1/4\, y^{-2/3}$
$\frac{d}{dx} f(g(x)) = \frac{df(g(x))}{dg(x)} \frac{dg(x)}{dx}$ chain rule
$\frac{de^{ax}}{dx} = \frac{de^{ax}}{d(ax)} \frac{d(ax)}{dx}$
$= ae^{ax}$
$\frac{d \sin ax}{dx} = a \cos ax$
$\frac{d}{dx}(3x^2+6x-2)^a = a(3x^2+6x-2)^{a-1}(6x+6)$
Introduction
$f(a) \le f(x) \le f(b)$
$f(a) \le \int f(x)$
$y = \arcsin x$
$= \sin^{-1} x$
$x = \sin y$
$\frac{dx}{dy} = \cos y = \sqrt{1-x^2}$
$\frac{dy}{dx} = \frac{1}{(\frac{dx}{dy})} = \frac{1}{\sqrt{1-x^2}}$
$= \frac{d}{d\theta} \frac{\sin\theta}{\cos\theta} = \frac{\cos^2\theta}{\cos^2\theta} + \sin\theta(-\frac{1}{\cos^2\theta})$
$(\leftarrow \sin\theta)$
$= 1 + \tan^2\theta = \sec^2\theta$


1. 請簽到
2. 前3有遺失物，請認領
計算機、手機充電器、筆記本
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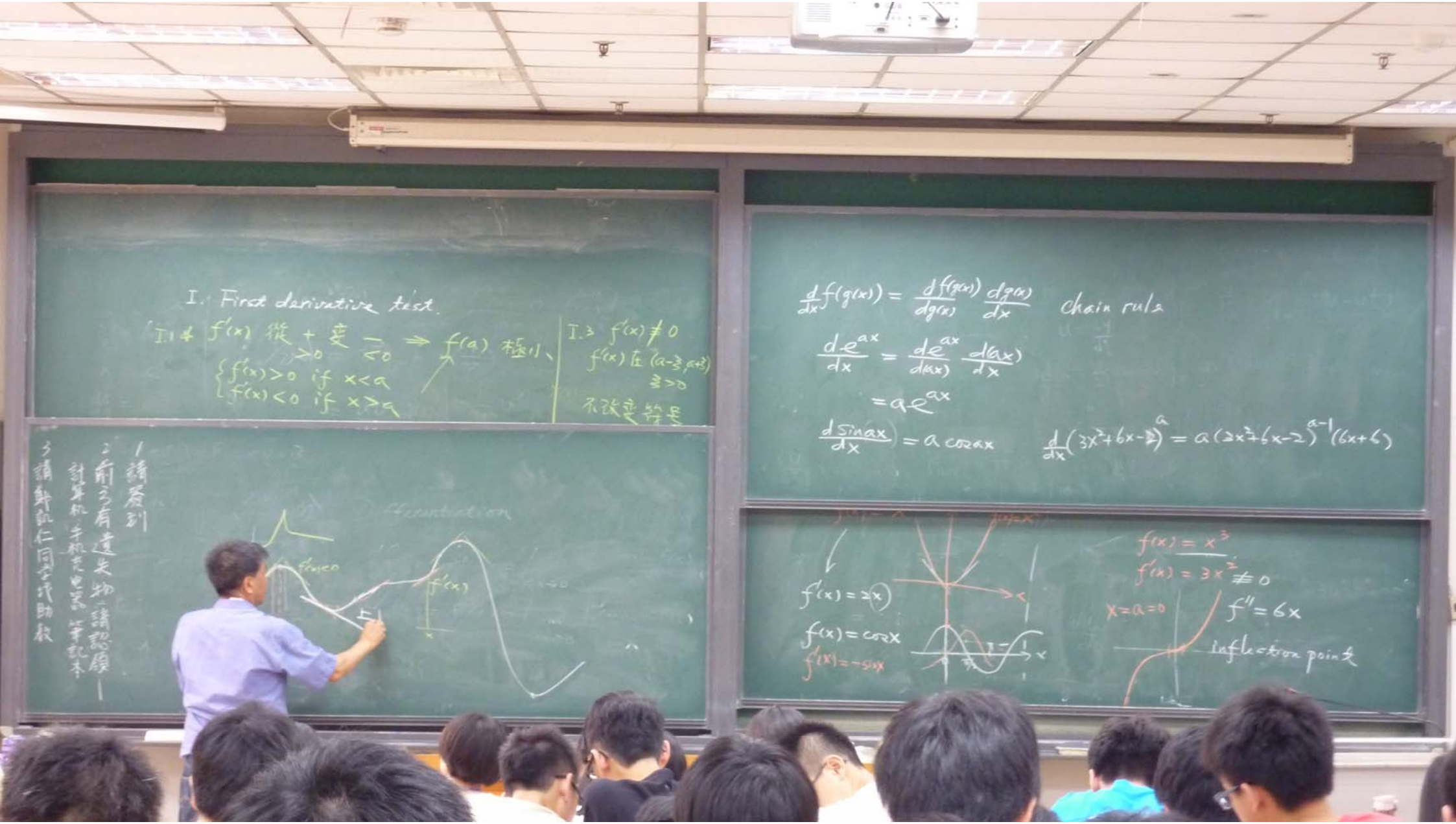
differentiation
f'(x)=0
f'(x)
f(a)≤f(b)
f(a)≤f(x)
I. First derivative test.
I.1 f'(x) 從 + 變 − ⇒ f(a) 極小
>0 <0
{f'(x)>0 if x<a
f'(x)<0 if x>a
I.2 {f'(x)<0, x<a
f'(x)>0, x>a
⇒ f(a) 是極大
I.3 f'(x)≠0
f'(x) 在 (a−ε, a+ε) ≷0
不改變符號
⇒ f(a) 不是
d/dx f(g(x)) = df(g(x))/dg(x) dg(x)/dx chain rule
de^ax/dx = de^ax/d(ax) d(ax)/dx
= ae^ax
d sin ax/dx = a cos ax
d/dx(3x²+6x−2)^a = a(3x²+6x−2)^(a−1)(6x+6)
y = x²
dy/dx = 1/(dx/dy) = 1/√(1−x²)
d tanθ/dθ = d/dθ sinθ/cosθ = cos²θ/cos²θ + sinθ(−1/cos²θ)
(−sinθ)
= 1 + tan²θ = sec²θ


I. First derivative test
I.1 f'(x) 從 + 變 − ⇒ f(a) 極小
>0 <0
f'(x)>0 if x<a
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I.2 f'(x)≠0
不改變符號
1 簽到
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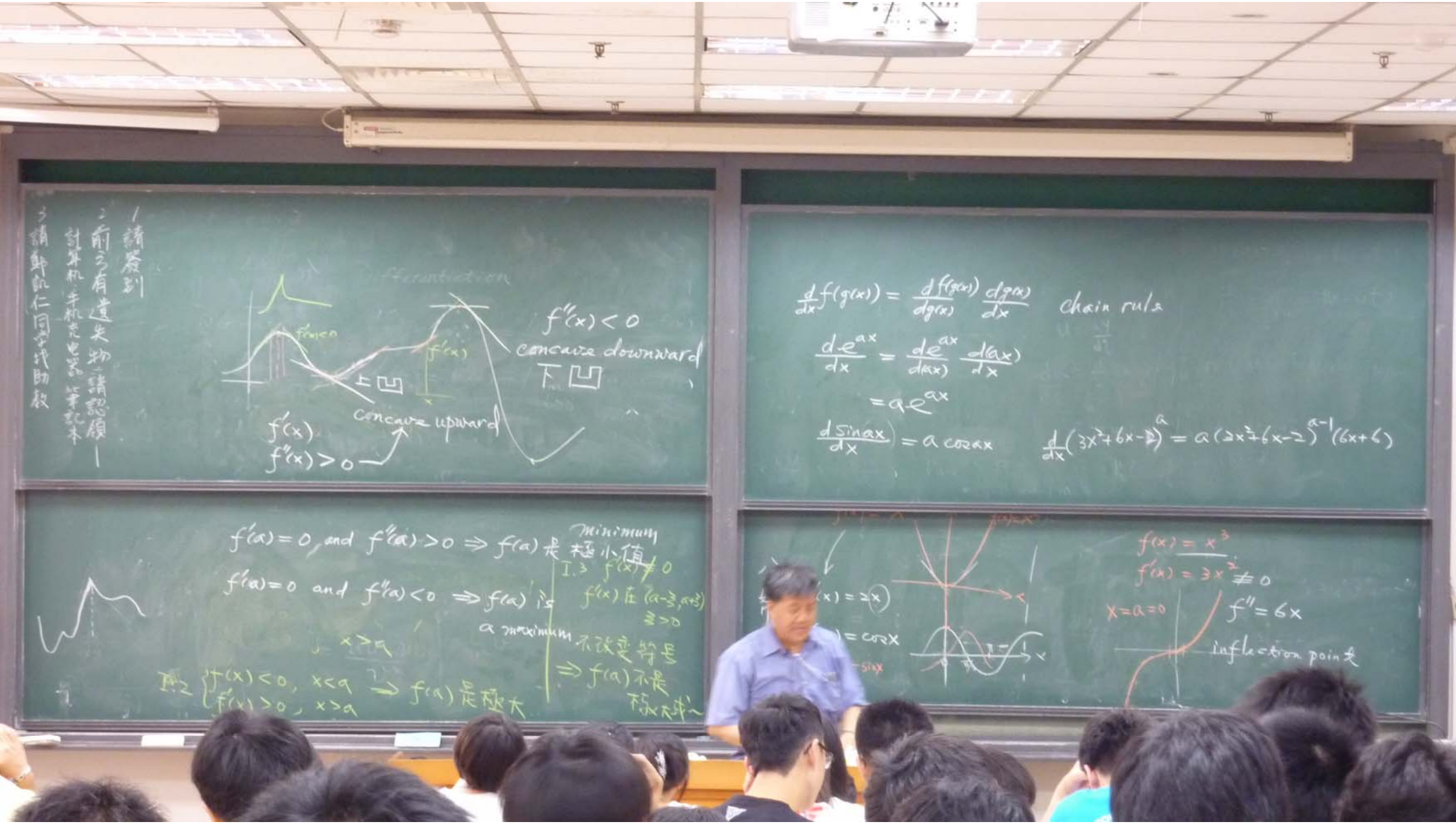
f(x)=0
f'(x)
f'(x)=2x
f(x)=cosx
f'(x)=-sinx
f(x)=x³
f'(x)=3x²≠0
x=0
f''=6x
inflection point
Chain rule
d/dx f(g(x)) = df(g(x))/dg(x) dg(x)/dx
de^ax/dx = de^ax/d(ax) d(ax)/dx
= ae^ax
d sinax/dx = a cosax
d/dx (3x²+6x-2)^a = a(3x²+6x-2)^(a-1)(6x+6)


1. 請簽到
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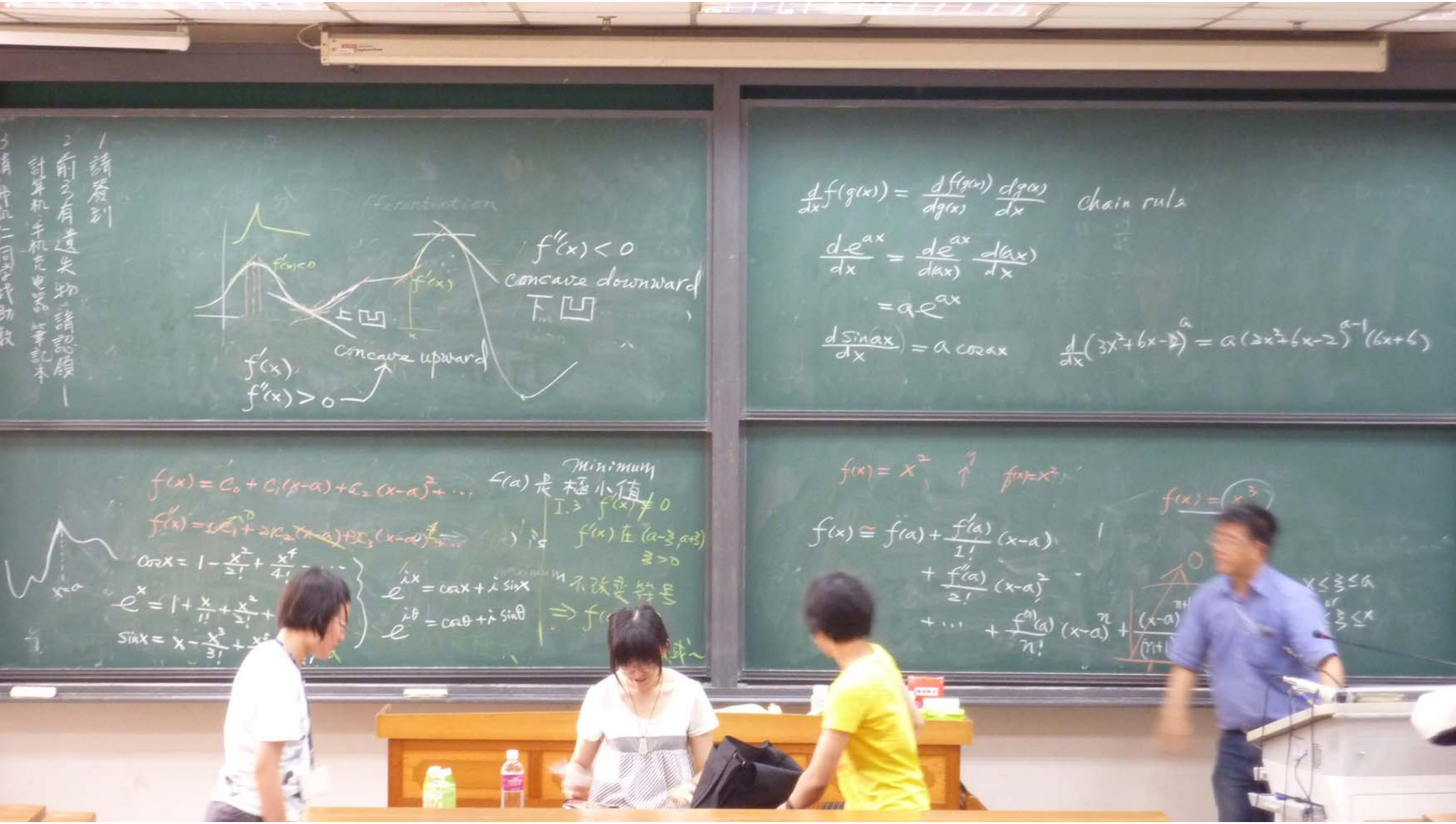
3. 請助教仁同學找助教
f''(x)<0
concave downward
下凹
f'(x)
f''(x)>0
concave upward
上凹
chain rule
f'(a)=0 and f''(a)>0 ⇒ f(a)是極小值
f'(a)=0 and f''(a)<0 ⇒ f(a) is a maximum
minimum
f(x)=x^3
f'(x)=3x^2
f''=6x
inflection point


f''(x) < 0
concave downward
下凹
f'(x)
上凹
concave upward
f''(x) > 0
chain rule
Minimum
f(a) 是極小值
f'(x) 在 (a-δ, a+δ)
不改變符號
f(x) = x²
f(x) = x³