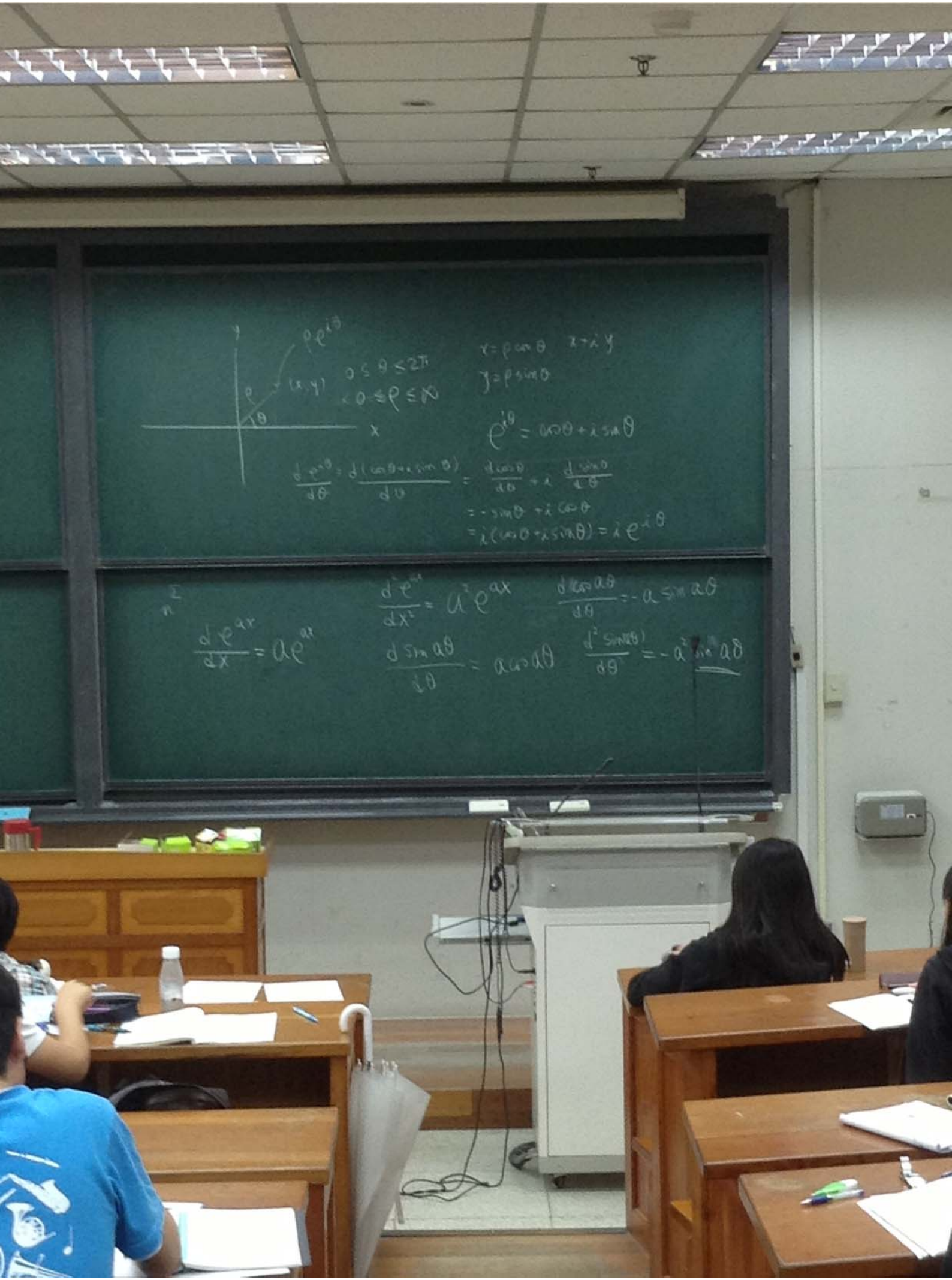
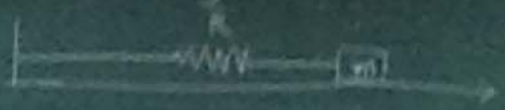

$\rho e^{i\theta}$
$0 \le \theta \le 2\pi$
$0 \le \rho \le \infty$
$x = \rho\cos\theta \quad z = x + iy$
$y = \rho\sin\theta$
$e^{i\theta} = \cos\theta + i\sin\theta$
$\frac{d}{d\theta} e^{i\theta} = \frac{d(\cos\theta + i\sin\theta)}{d\theta} = \frac{d\cos\theta}{d\theta} + i\frac{d\sin\theta}{d\theta}$
$= -\sin\theta + i\cos\theta$
$= i(\cos\theta + i\sin\theta) = i e^{i\theta}$
n^2
$\frac{d^2 e^{ax}}{dx^2} = a^2 e^{ax}$
$\frac{d e^{ax}}{dx} = a e^{ax}$
$\frac{d\cos a\theta}{d\theta} = -a\sin a\theta$
$\frac{d\sin a\theta}{d\theta} = a\cos a\theta$
$\frac{d^2(\sin a\theta)}{d\theta^2} = -a^2\sin a\theta$

$ma = F = -kx$



$ma + kx = 0$

$m\frac{d^2x(t)}{dt^2} + kx(t) = 0$

$t=0,\ x=A$
$\dot{x}=0$

B.C.

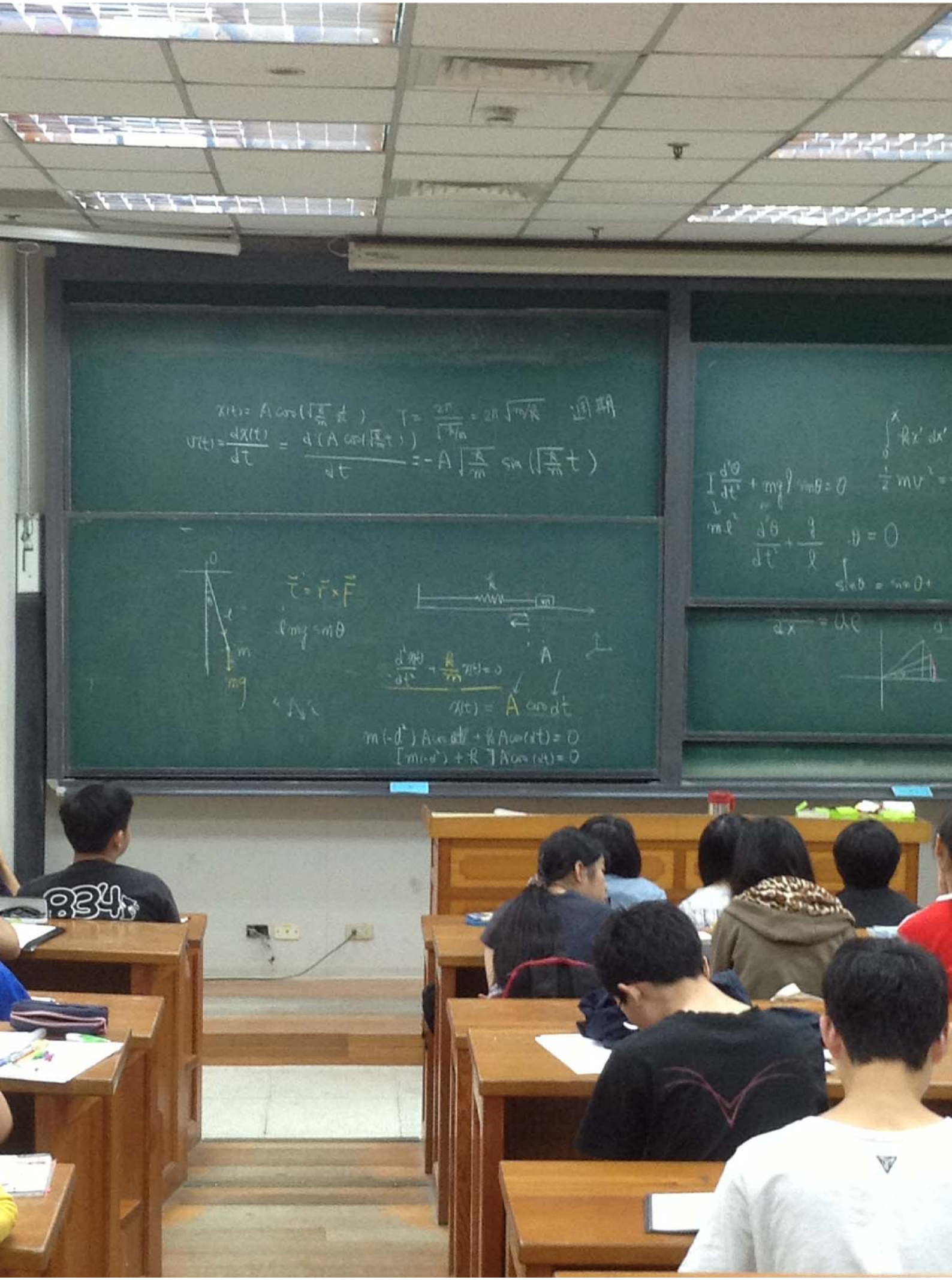
A

$x(t) = A\cos\omega t$

$m(-\omega^2)A\cos\omega t + kA\cos(\omega t) = 0$

$[m(-\omega^2) + k]A\cos(\omega t) = 0$

$x(t) = A\cos\left(\sqrt{\frac{k}{m}}t\right)$ $\quad T = \frac{2\pi}{\sqrt{k/m}}$


$x(t) = A\cos(\sqrt{\frac{k}{m}}t)$ $T = \frac{2\pi}{\sqrt{k/m}} = 2\pi\sqrt{m/k}$ 週期
$v(t) = \frac{dx(t)}{dt} = \frac{d(A\cos(\sqrt{\frac{k}{m}}t))}{dt} = -A\sqrt{\frac{k}{m}}\sin(\sqrt{\frac{k}{m}}t)$
$\vec{\tau} = \vec{r} \times \vec{F}$
$\ell mg\sin\theta$
$\frac{d^2x(t)}{dt^2} + \frac{k}{m}x(t) = 0$
$x(t) = A\cos\omega t$
$m(-\omega^2)A\cos\omega t + kA\cos(\omega t) = 0$
$[m(-\omega^2) + k]A\cos(\omega t) = 0$
$I\frac{d^2\theta}{dt^2} + mg\ell\sin\theta = 0$
$m\ell^2\frac{d^2\theta}{dt^2} + \frac{g}{\ell}\theta = 0$
$\sin\theta = \sin\theta$
$\int_0^x kx'\,dx'$
$\frac{1}{2}mv^2$
$dx = \omega\ell$

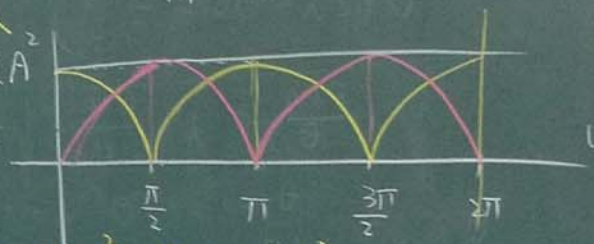
$$\int_0^x kx'\,dx' = \frac{1}{2}kx(t)^2 = \frac{1}{2}kA^2\cos^2\left(\sqrt{\frac{k}{m}}t\right)$$

$$\frac{1}{2}mv^2 = \frac{1}{2}mA^2\frac{k}{m}\sin^2\left(\sqrt{\frac{k}{m}}t\right) \qquad \omega$$

$$I\frac{d^2\theta}{dt^2} + mgl\sin\theta = 0$$

$$\downarrow$$

$$ml^2\frac{d^2\theta}{dt^2} + \frac{g}{l}\theta = 0$$



$$\sin\theta = \sin 0 + \cos 0\,\theta + \frac{1}{2!}(-\sin 0)\theta^2 + \frac{1}{3!}(-\cos 0)\theta^3 + \cdots$$

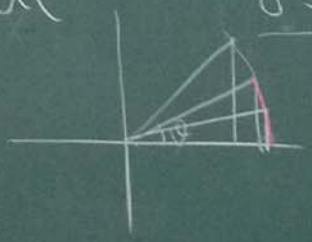
$$\left(\theta - \frac{1}{6}\theta^3 \cdots\right)$$

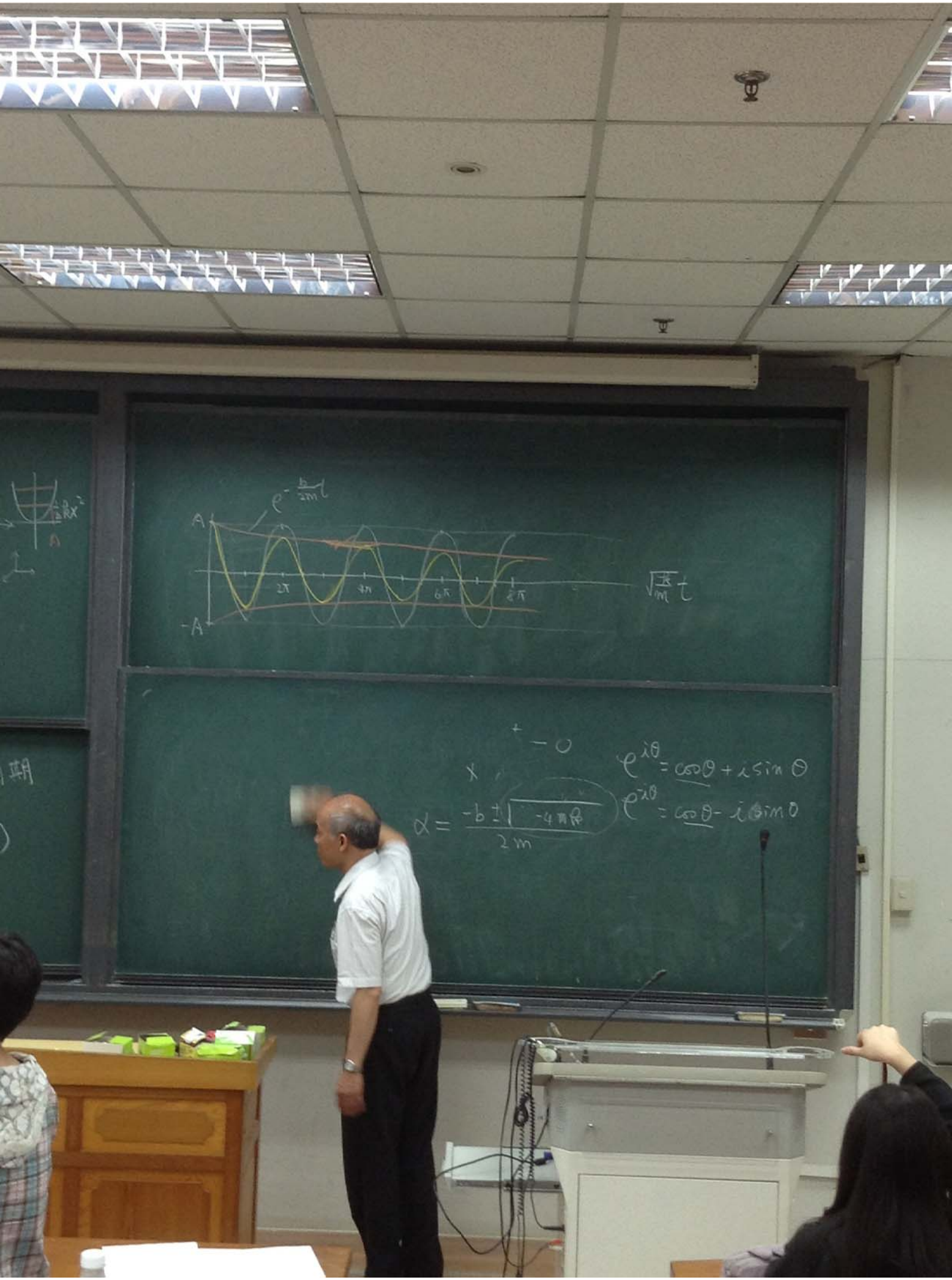
$$\sum_n$$

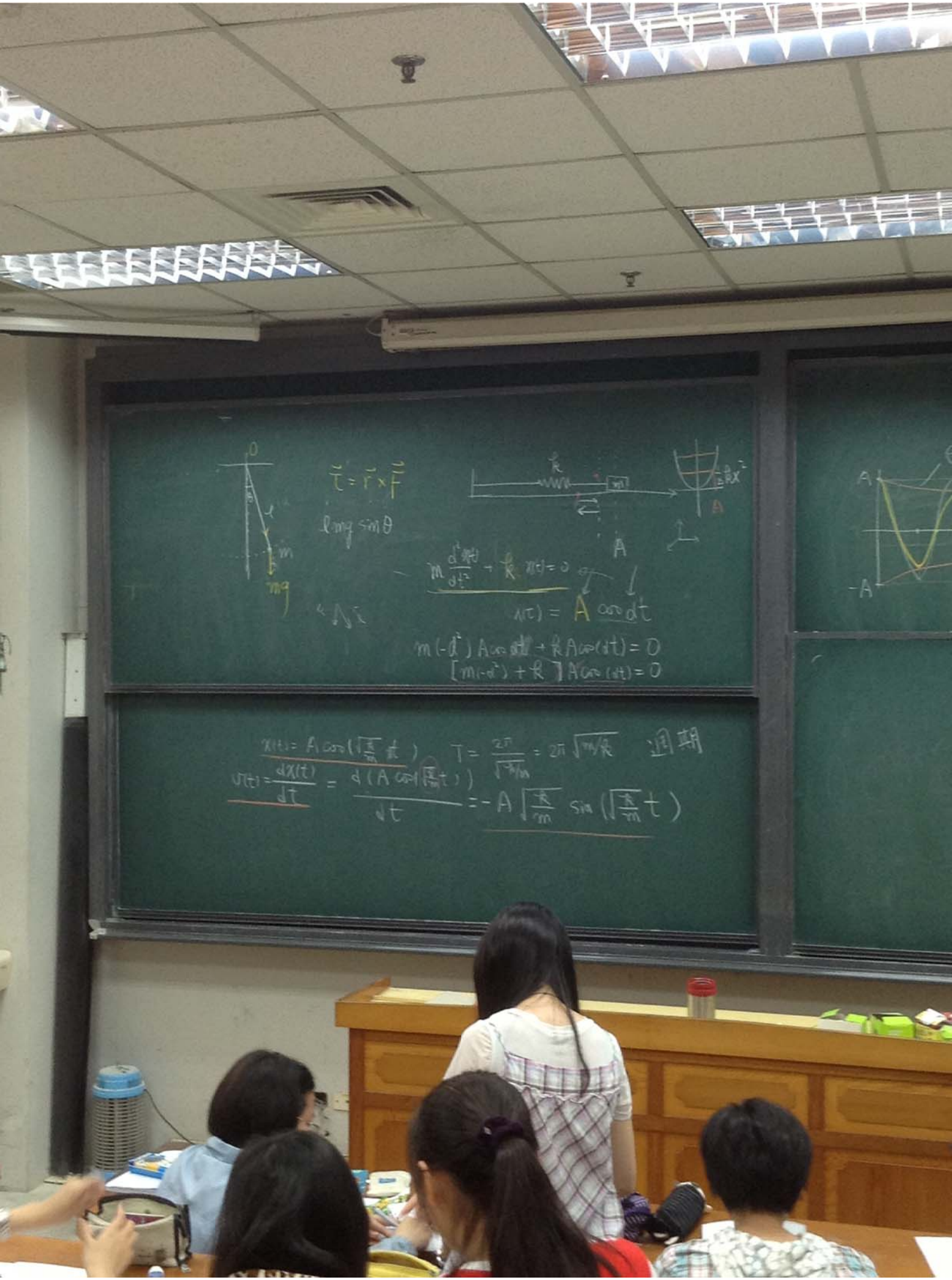
$$\frac{de^{ax}}{dx} = ae^{ax} \qquad \frac{d^2e^{ax}}{dx^2} = a^2e^{ax}$$

$$\frac{d\cos a\theta}{d\theta} = -a\sin a\theta$$

$$\frac{d\sin a\theta}{d\theta} = a\cos a\theta \qquad \frac{d^2\sin(a\theta)}{d\theta^2} = -a^2\sin a\theta$$




A
-A
2π
4π
6π
8π
$\sqrt{\frac{k}{m}}t$
$e^{-\frac{b}{2m}t}$
$e^{i\theta} = \cos\theta + i\sin\theta$
$e^{-i\theta} = \cos\theta - i\sin\theta$
$\alpha = \frac{-b \pm \sqrt{\quad -4mk}}{2m}$


O
m
mg
$\vec{\tau} = \vec{r} \times \vec{F}$
$-lmg\sin\theta$
$m\frac{d^2x(t)}{dt^2} + kx(t) = 0$
$x(t) = A\cos\omega t$
$m(-\omega^2)A\cos\omega t + kA\cos(\omega t) = 0$
$[m(-\omega^2) + k]A\cos(\omega t) = 0$
$x(t) = A\cos(\sqrt{\frac{k}{m}}t)$
$T = \frac{2\pi}{\sqrt{k/m}} = 2\pi\sqrt{m/k}$ 週期
$v(t) = \frac{dx(t)}{dt} = \frac{d(A\cos(\sqrt{\frac{k}{m}}t))}{dt} = -A\sqrt{\frac{k}{m}}\sin(\sqrt{\frac{k}{m}}t)$
A
-A