0.1 Interesting functions

Weierstrass function

$$f(x) = \sum_{n=0}^{\infty} a^n cos(b^n \pi x) \tag{1}$$

Continuous but not derivative everywhree.

0.2 Differentive Equations

First Order Equation

$$\frac{dV}{dt} + \eta(t)V(t) = f(t)$$

so:

$$\frac{1}{I}\frac{d(I(t)V(t))}{dt} = \frac{dV(t)}{dt} + \frac{I'(t)}{I(t)}V(t)$$

if:

$$\frac{I'(t)}{I(t)} = \eta(t) \rightarrow I(t) = exp(\int^t dt'\eta(t'))$$

so:

$$\frac{d(I(t)V(t))}{Idt} = f(t)$$

Floquet theory

$$\ddot{x} + \omega_0^2(1 + \mu cos(\nu t))x = 0 \tag{2}$$

Analogy to QM(Schrodinger Equation):

$$-\frac{\hbar^2}{2m}\psi'' + U(x)\psi = E\psi$$

where $U(x) = -U_0 cos\frac{2\pi x}{a}$. So let

$$k^2 = \frac{2mE}{\hbar^2}, u = \frac{U_0}{E}, \nu = \frac{2\pi}{a}$$

u is small, we will get

$$\psi'' + k^2\psi = -k^2 u cos(\nu x)\psi$$

0.3 Integrated functions

Γ function

$$\Gamma(z) \equiv \int_0^{+\infty} dt e^{-t} t^{z-1} = 2\int_0^{+\infty} dx e^{-x^2} x^{2z-1}$$

$$\Gamma(z)\Gamma(1-z) = \frac{\pi}{sin\pi z}$$