$\oint_{surface} \vec{E}\cdot d\vec{A} = Q/\epsilon_0$

$\oint_{surface} \vec{B}\cdot d\vec{A} = 0$

$\oint_{loop} \vec{E}\cdot d\vec{s} = -\frac{d\Phi_B}{dt}$

$\oint_{loop} \vec{B}\cdot d\vec{s} = \mu_0 I_{in} + \epsilon_0\mu_0 \frac{d\Phi_E}{dt}$

$c = 3.00\times 10^8\, m/s$ $\quad h = 6.626\times 10^{-34}\, J\cdot s$ $\quad \hbar = \frac{h}{2\pi}$ $\quad \alpha \doteq \frac{1}{137}$ $\quad m_e = 9.11\times 10^{-31}\, kg$ $\quad m_e c^2 = 0.511\, MeV$

$e = -1.6\times 10^{-19}\, C$ $\quad \hbar c = 197.33\, MeV\cdot fm$ $\quad m_p = 1.673\times 10^{-27}\, kg$ $\quad m_p c^2 = 938.3\, MeV$

$k_B = 1.38\times 10^{-23}\, J/K$ $\quad hc = 12400\, eV\cdot Å$ $\quad \pi = 3.1416$ $\quad m_n = 1.675\times 10^{-27}\, kg$ $\quad m_n c^2 = 939.6\, MeV$

$k = \frac{1}{4\pi\epsilon_0} = 9.0\times 10^9\, \frac{N\cdot m^2}{C^2}$ $\quad = 1240\, eV\cdot nm$ $\quad e^{-1} = 0.37$ $\quad \lambda_C = \frac{h}{mc} = 2.4\times 10^{-12}\, m$ $\quad \frac{m_e}{m_p} \doteq \frac{1}{1836}$

$= 1240\, MeV\cdot fm$ $\quad 2\pi\, rad = 360°$

$\epsilon_0 = 8.85\times 10^{-12}\, \frac{C^2}{N\cdot m^2}$ $\quad k_B T(20°C) \simeq \frac{1}{40} eV$ $\quad 1\, eV = 1.6\times 10^{-19}\, J$ $\quad G = 6.67\times 10^{-11}\, \frac{N\cdot m^2}{kg^2}$

$\mu_0 = 4\pi\times 10^{-7}\, \frac{T\cdot m}{A}$ $\quad 1\, Wb = 1\, T\cdot m$ $\quad 1\, nm = 10^{-9}\, m$ $\quad 1\, Å = 10^{-10}\, m$ $\quad 1\, fm = 10^{-15}\, m$

$1\, Ci = 3.7\times 10^{10}$ decays/s

$c = \frac{1}{\sqrt{\epsilon_0\mu_0}}$ $\quad E = cB$ $\quad \vec{E}\cdot\vec{B} = 0$ $\quad v = \frac{c}{n}$

$\frac{\partial^2 E_y}{\partial x^2} - \frac{1}{c^2}\frac{\partial^2 E_y}{\partial t^2} = 0$ $\quad \frac{\partial^2 B_z}{\partial x^2} - \frac{1}{c^2}\frac{\partial^2 B_z}{\partial t^2} = 0$

$u = \frac{1}{2}\epsilon_0 E^2 + \frac{1}{2\mu_0}B^2$ $\quad p = \begin{cases} U/c \text{ (absorb)} \\ 2U/c \text{ (reflect)} \end{cases}$

$\vec{S} = \frac{1}{\mu_0}\vec{E}\times\vec{B}$ $\quad S = \frac{1}{\mu_0}EB = cu$

$I = \langle S\rangle = c\epsilon_0\langle E^2\rangle = \frac{1}{2}c\epsilon_0 E^2$

$N_0 = 6.02\times 10^{23}\, \frac{\text{particles}}{\text{mole}}$ $\quad$ visible light: $\lambda = 430\, nm \to 690\, nm$

human eye most sensitive to: $\lambda \doteq 555\, nm$

$\Delta L = n\lambda$ $\quad \sin\theta = \frac{n\lambda}{d}$ $\quad 4nt = (2m-1)\lambda$ $\quad 4nt = 2m\lambda$

$\Delta L = \left(n+\frac{1}{2}\right)\lambda$ $\quad \sin\theta = \left(n+\frac{1}{2}\right)\frac{\lambda}{d}$ $\quad m = 0, \pm1, \pm2, \pm3, \ldots$

$n = 0, \pm1, \pm2, \pm3, \ldots$ $\quad R = \frac{\lambda}{\Delta\lambda} = mN$ $\quad \frac{\Delta\theta}{\Delta\lambda} = \frac{m}{d\cos\theta}$

$y = R\tan\theta \simeq R\sin\theta = \begin{cases} n\,\lambda R/d \\ \left(n+\frac{1}{2}\right)\lambda R/d \end{cases}$ $\quad a\sin\theta = m\lambda$

$m = \pm1, \pm2, \pm3, \ldots$

Sun, Earth & Moon

$1\, A.U. = 1.5\times 10^{11}\, m$

Sun: $M_\odot = 1.989\times 10^{30}\, kg$

$L_\odot = 3.827\times 10^{26}\, W$

$R_\odot = 6.96\times 10^5\, km$

Earth: $M_\oplus = 5.97\times 10^{24}\, kg$

$R_\oplus = 6.38\times 10^3\, km$ (at equator)

Moon:

$M_☾ = 7.34\times 10^{22}\, kg$

$R_☾ = 1.74\times 10^3\, km$

$c = f\lambda$ $\quad I = I_1 + I_2 + 2\sqrt{I_1 I_2}\cos\phi$ $\quad I = 4I_0\cos^2(\phi/2) = 4I_0 \cos^2\left(\frac{\pi d}{\lambda}\sin\theta\right)$

$\theta_{incident} = \theta_{reflected}$ $\quad n_1\sin\theta_1 = n_2\sin\theta_2$ $\quad \theta_{min} = 1.22\frac{\lambda}{D}$ $\quad s_{min} = f\theta_{min} = f\frac{\lambda}{D}$

$I = I_0\left[\frac{\sin(N\beta)}{\sin\beta}\right]^2$ $\quad \beta = \frac{\pi d\sin\theta}{\lambda}$ $\quad I = \underbrace{N^2 I_0}\frac{\sin^2\alpha}{\alpha^2}$ $\quad \alpha = \frac{\pi a\sin\theta}{\lambda}$

$I = I_{max}\left[\frac{\sin(N\beta)}{\sin\beta}\right]^2\left(\frac{\sin\alpha}{\alpha}\right)^2$

$t' = t$ $\quad x' = x - ut$ $\quad y' = y$ $\quad z' = z$

$t' = \gamma\left(t - \frac{ux}{c^2}\right)$ $\quad \gamma = \frac{1}{\sqrt{1-u^2/c^2}}$ $\quad T' = \gamma T$ $\quad L' = \frac{1}{\gamma}L$

$x' = \gamma(x - ut)$ $\quad y' = y$ $\quad q' = q$ $\quad \beta = u/c$ $\quad \Delta t_{unsync} = \frac{v}{c^2}L_0$

$z' = z$ $\quad x'^2 + y'^2 + z'^2 - c^2t'^2 = x^2 + y^2 + z^2 - c^2t^2$

$u = \tanh\eta$

$\begin{matrix}\cosh\eta \\ \sinh\eta\end{matrix}\Big\} = \frac{1}{2}\left(e^{\eta} \pm e^{-\eta}\right)$

$f_1 = f_0\sqrt{\frac{1+u/c}{1-u/c}}$ (approaching) $\quad v_x = \frac{v'_x + u}{1 + v'_x u/c^2}$ $\quad v_y = \frac{v'_y}{\gamma(1 + v'_x u/c^2)}$

$\Delta t = \frac{1}{c}\left[2(L_1 - L_2) + \frac{v^2}{c^2}(2L_1 - L_2)\right] = \frac{2L}{c}\frac{1}{2}\frac{v^2}{c^2}$ (for $L = L_1 = L_2$)

$f_1 = f_0\sqrt{\frac{1-u/c}{1+u/c}}$ (receding) $\quad p = \gamma mv = \frac{mv}{\sqrt{1-v^2/c^2}}$ $\quad \vec{v} = \frac{c^2\vec{p}}{E}$ $\quad E = \gamma mc^2$ $\quad E = \sqrt{c^2p^2 + m^2c^4}$ $\quad T = K.E. = (\gamma - 1)mc^2$

$f_1 = f_0\sqrt{1 - u^2/c^2}$ (transverse) $\quad D = \frac{u}{H}$ Hubble constant 50—100 $km/s/Mpc$

$\frac{f'}{f} = 1 + \frac{\phi}{c^2}$ $\quad \frac{f'}{f} = \left(1 - \frac{2GM}{Rc^2}\right)^{\frac{1}{2}}$ $\quad R = \frac{2GM}{c^2}$ $\quad 1\, pc = 3.26\, \ell yr$

$\lambda = \frac{h}{p}$ $\quad p = \hbar k$ $\quad E = hf$ $\quad E = \hbar\omega$ $\quad \omega = \sqrt{k/m}$

$\Delta p\Delta x \geq \hbar/2$ $\quad \Delta E\Delta t \geq \hbar/2$ $\quad \Delta L\Delta\theta \geq \hbar/2$

$\Delta x = x - \bar{x}$

$\bar{x} = 0 \Rightarrow (\Delta x)^2 = \overline{x^2}$ $\quad \bar{p} = 0 \Rightarrow (\Delta p)^2 = \overline{p^2}$

$n(f) = \frac{8\pi}{c^2}f^2$ $\quad n(\lambda) = \frac{8\pi}{\lambda^4}$ $\quad \mathcal{R} = \frac{c}{4}U$ $\quad \mathcal{R} = \epsilon\sigma T^4$ $\quad U = \epsilon a T^4$

$u(f,T) = \frac{8\pi f^2}{c^3}k_B T$ $\quad \frac{c^2}{} \times$ $\quad \cancel{u(\lambda,T) = \frac{8\pi}{\lambda^4}k_B T}$ $\quad \epsilon = \frac{\text{fraction}}{\text{absorbed}} = 1 - \frac{\text{fraction}}{\text{reflected}}$ $\quad f \simeq exp\left[-\frac{2}{\hbar}a\sqrt{2m(\langle U\rangle - E)}\right]$ → Tunneling

黑体辐射 $\quad u(f,T) = \frac{8\pi h}{c^3}\frac{f^3}{e^{\frac{hf}{k_BT}} - 1}$ $\quad \frac{c}{\lambda}$ $\quad \cancel{u(\lambda,T) = \frac{8\pi hc}{\lambda^5}\frac{1}{e^{\frac{hc}{\lambda k_BT}} - 1}}$ $\quad \sigma = 5.67\times 10^{-8}\frac{J}{s\cdot m^2\cdot K^4}$ $\quad N = N_0 e^{-t/\tau}$ $\quad \tau = 1/\lambda$ $\quad t_{\frac{1}{2}} \doteq \tau\ln 2$

$U(T) = \int_0^\infty u(\lambda,T)d\lambda = \int_0^\infty u(f,T)df$ $\quad \lambda_{max}T = 0.2898\, cm\cdot K$ $\quad hf = (K.E.)_e + W$ $\quad$ Bragg: $2d\sin\theta = n\lambda$?

$\lambda' - \lambda = \frac{h}{mc}(1 - \cos\theta)$ Compton.

$L = n\hbar$ $\quad r_n = \frac{n^2}{Z}a_0$ $\quad a_0 = \frac{\hbar^2}{km_e e^2} = 0.53\times 10^{-10}\, m$ $\quad E_n = -\frac{Z^2}{n^2}E_0$ $\quad E_0 = \frac{m_e e^4 k^2}{2\hbar^2} = 13.61\, eV$ $\quad hf = E_i - E_f$

$\frac{1}{\lambda} = Z^2 R_\infty\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$ $\quad R_\infty = \frac{m_e e^4 k^2}{4\pi c\hbar^3} = 1.0974\times 10^7\, 1/m$ $\quad hcR_\infty = 13.61\, eV$ $\quad \frac{N_n}{N_0} = \frac{g_n}{g_0}\exp\left(-\frac{E_n - E_0}{k_B T}\right)$

$\vec{\mu} = \frac{Q}{2M}\vec{L}$ $\quad |\vec{L}| = \sqrt{\ell(\ell+1)}\hbar$ $\quad L_z = m_\ell\hbar$ $\quad M = \frac{M_1 M_2}{M_1 + M_2}$ $\quad E = \frac{3}{2}k_B T$ $\quad \mu_B = \frac{|e|\hbar}{2m_e} = 9.27\times 10^{-24}\, J/T$

$U = -\vec{\mu}\cdot\vec{B}$ $\quad F_z = -\frac{dU}{dz}$ $\quad E = -\frac{e^2}{8\pi\epsilon_0 r}$ $\quad$ specroscopic notation: $n^{2s+1}L_j$ $\quad = 5.79\times 10^{-9}\, eV/Gauss$

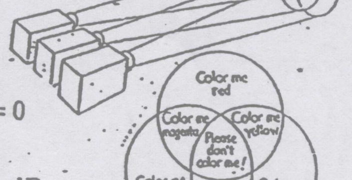
$E = \frac{\hbar^2}{2mL^2}$ $\quad E = \frac{n^2h^2}{8mb^2}$ $\quad \vec{\mu} = \frac{Q}{2M}\vec{L}$ $\quad \omega_L = \frac{Q}{2M}B$ $\quad E_F = \frac{\hbar^2}{2m}\left(3\pi^2 n\right)^{2/3}$

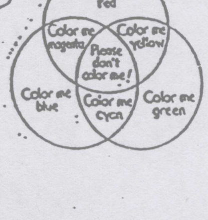
$E_n = (n + 1/2)\hbar\omega$ $\quad \vec{\tau} = \vec{\mu}\times\vec{B}$ $\quad \Delta E = \left|\frac{e\hbar}{2m}B\right|$ $\quad \bar{E} = \frac{3}{5}E_F$

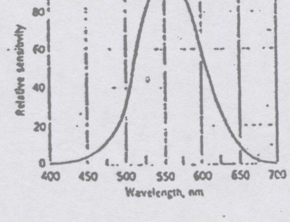
$E_{vib} = nE_0\sqrt{Z_1 Z_2}\sqrt{\frac{m_e}{M}}$

$E = \frac{L^2}{2I}$, $\quad I = Mr_0^2$ $\quad E = \frac{\ell(\ell+1)\hbar^2}{2I}$, $\quad E_F \doteq \frac{\pi^2}{3}\hbar c n^{1/3}$ for $m = 0$

$E_{rot} = \frac{\ell(\ell+1)}{4}E_0\frac{m_e}{M}$ $\quad p_F = \frac{2}{5}\frac{\hbar^2}{2m}\left(3\pi^2\right)^{2/3}n^{5/3}$ where $p = -\frac{dE}{dV}$







$$1\,Gauss = 10^{-4}T$$

$k = 9\times 10^{9}\,\dfrac{N\cdot m^2}{C^2} = \dfrac{1}{4\pi\epsilon_0}$ $\quad e = -1.6\times 10^{-19}\,C$ $\quad m_e = 9.109\times 10^{-31}\,kg$ $\quad \pi \doteq 3.1416$

$k_B = 1.38\times 10^{-23}\,J/K$ $\quad 2\pi\,rad = 360^\circ$

$\epsilon_0 = 8.85\times 10^{-12}\,\dfrac{C^2}{N\cdot m^2}$ $\quad k_BT(20^\circ) \simeq \dfrac{1}{40}\,eV$ $\quad m_p = 1.673\times 10^{-27}\,kg$ $\quad e^{-1} \doteq 0.37$

$m_n = 1.675\times 10^{-27}\,kg$ $\quad 1\,nm = 10^{-9}\,m$

$\mu_0 = 4\pi\times 10^{-7}\,\dfrac{Wb}{A\cdot m}$ $\quad 1\,Wb = 1\,T\cdot m^2$ $\quad R = N_0k_B$ $\quad 1\,eV = 1.6\times 10^{-19}\,J$ $\quad 1\,\mathring{A} = 10^{-10}\,m$

$c = 3.00\times 10^{8}\,m/s$ $\quad N_0 = 6.022\times 10^{23}\,\dfrac{\text{particles}}{mole}$ $\quad 1\,kW\cdot hr = 3.6\times 10^{6}\,J$ $\quad E = mc^2$

$\vec{F} = m\vec{a}$ $\quad F = \dfrac{mv^2}{r}$ $\quad \vec{F} = q\vec{E}$ $\quad F = -\dfrac{dU}{dx}$ $\quad P = \vec{F}\cdot\vec{v}$

$\vec{F}_{12} = \dfrac{kq_1q_2}{r_{12}^2}\hat{r}_{12}$ $\quad \vec{E} = \dfrac{kq}{r^2}\hat{r}$ $\quad V = \dfrac{kq}{r}$ $\quad \Delta V = V_b - V_a = -\displaystyle\int_{r_b}^{r_a}\vec{E}\cdot d\vec{s}$

$T = \dfrac{2\pi}{\omega} = \dfrac{1}{f}$ $\quad E = \dfrac{\sigma}{2\epsilon_0}$ $\quad V = Ed$ $\quad \vec{E} = -\vec{\nabla}V$ $\quad U = -\vec{p}\cdot\vec{E}$

$\vec{\tau} = \vec{p}\times\vec{E}$ $\quad E = \dfrac{\sigma}{\epsilon_0}$

with no dielectric or magnetic materials

Max. 1 $\displaystyle\oint_{surface}\vec{E}\cdot d\vec{A} = q_{in}/\epsilon_0$

Max. 2 $\displaystyle\oint_{surface}\vec{B}\cdot d\vec{A} = 0$

Max. 3 $\displaystyle\oint_{loop}\vec{E}\cdot d\vec{s} = -\frac{d\Phi_B}{dt}$ $\quad \mathcal{E} = \displaystyle\int_{loop}\vec{E}\cdot d\vec{s}$

$\Phi_B = \displaystyle\int_{surface}\vec{B}\cdot d\vec{A}$

Max. 4 $\displaystyle\oint_{loop}\vec{B}\cdot d\vec{s} = \mu_0 I_{in} + \epsilon_0\mu_0\frac{d\Phi_E}{dt}$

$c = \dfrac{1}{\sqrt{\epsilon_0\mu_0}}$ $\quad I_d = \epsilon_0\dfrac{d\Phi_E}{dt}$ $\quad \Phi_E = \displaystyle\int_{surface}\vec{E}\cdot d\vec{A}$

$C = \dfrac{Q}{V}$ $\quad C = \dfrac{\epsilon_0 A}{d}$ $\quad C = \kappa C_0$ $\quad \epsilon = \kappa\epsilon_0$

$U = \dfrac{Q^2}{2C} = \dfrac{1}{2}CV^2 = \dfrac{1}{2}QV$ $\quad \sigma_{ind} = \sigma(1 - 1/\kappa)$

$u_E = \dfrac{U}{V} = \dfrac{1}{2}\epsilon_0 E^2$ $\quad C_{eq} = C_1 + C_2 + \cdots + C_n$

$\displaystyle\oint_{surface}\kappa\vec{E}\cdot d\vec{A} = q_{in}/\epsilon_0$ $\quad \dfrac{1}{C_{eq}} = \dfrac{1}{C_1} + \dfrac{1}{C_2} + \cdots + \dfrac{1}{C_n}$

$I = \dfrac{dQ}{dt}$ $\quad I = \displaystyle\int_{surface}\vec{J}\cdot d\vec{A}$ $\quad \vec{J} = n_q q\vec{v}$ $\quad \sigma = \dfrac{1}{\rho}$ $\quad \displaystyle\sum_{node} I_i = 0$ $\quad \displaystyle\sum_{loop}\Delta V_i = 0$

$\vec{E} = \rho\vec{J}$ $\quad \vec{J} = \sigma\vec{E}$ $\quad V = IR$ $\quad R = \rho\dfrac{L}{A}$ $\quad \tau_C = RC$

$P = IV$ $\quad P = I^2R = V^2/R$ $\quad v_d = \dfrac{1}{n_e qA}$ $\quad I = \dfrac{\mathcal{E}}{R}e^{-t/RC}$

$\dfrac{1}{R_{eq}} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \cdots + \dfrac{1}{R_n}$ $\quad Q = C\mathcal{E}(1 - e^{-t/RC})$

$V_C = \mathcal{E}(1 - e^{-t/RC})$ $\quad V_R = \mathcal{E}e^{-t/RC}$

$R_{eq} = R_1 + R_2 + \cdots + R_n$

$\omega = \dfrac{1}{\sqrt{LC}}$ $\quad I = \dfrac{\mathcal{E}}{R}(1 - e^{-Rt/L})$

$\tau_L = L/R$ $\quad I = \dfrac{\mathcal{E}}{R}e^{-Rt/L}$

$\omega' = \sqrt{\omega^2 - \left(\dfrac{R}{2L}\right)^2}$ $\quad \alpha = \dfrac{R}{2L}$

$Q = Q_0 e^{-\alpha t}\cos(\omega' t + \phi)$

$\vec{F} = q\vec{E} + q\vec{v}\times\vec{B}$ $\quad R = \dfrac{mv}{qB}$

$\vec{F} = I\vec{L}\times\vec{B}$ $\quad F = \dfrac{\mu_0 I_1 I_2 L}{2\pi d}$

$V = \dfrac{k}{r}\displaystyle\int\rho\,dV' + \frac{k}{r^2}\int r'\cos\theta\,\rho\,dV' + \frac{k}{r^3}\int r'^2\frac{3\cos\theta - 1}{2}\rho\,dV' + \cdots$

$d\vec{B} = \dfrac{\mu_0}{4\pi}\dfrac{I\,d\vec{\ell}\times\vec{r}}{r^3}$ $\quad B = \dfrac{\mu_0 I}{2\pi r}$

$\vec{p} = \displaystyle\int\vec{r}'\rho\,dV' = \sum_i\vec{r}_i q_i$ (discrete) $\quad V = k\dfrac{\hat{r}\cdot\vec{p}}{r^2}$

$v = \dfrac{E}{B}$ $\quad f = \dfrac{qB}{2\pi m}$ $\quad I = \dfrac{Bv\ell}{R}$ $\quad \mathcal{E} = Bv\ell$ $\quad B = \dfrac{\mu_0 NI}{2\pi\rho}$ $\quad B = \mu_0 nI$ $\quad B = \dfrac{\mu_0 IR^2}{2(R^2 + z^2)^{3/2}}$ $\quad B = \dfrac{\mu_0 I}{2R}$

$\mu = NIA$ $\quad \vec{\tau} = \vec{\mu}\times\vec{B}$ $\quad U = -\vec{\mu}\cdot\vec{B}$ $\quad \Phi_B = LI$ $\quad \mathcal{E} = -\dfrac{d\Phi_B}{dt} = -L\dfrac{dI}{dt}$ $\quad \mathcal{E}_{12} = -M_{12}\dfrac{dI_1}{dt}$

$M_{21} = M_{12}$ $\quad \vec{B} = \vec{B}_0 + \mu_0\vec{M}$ $\quad \vec{B}_0 = \mu_0\vec{H}$ $\quad \vec{H} = \dfrac{\vec{B}_0}{\mu_0} - \vec{M}$ $\quad \vec{B} = \mu_0\vec{H} + \mu_0\vec{M}$ $\quad \vec{M} = \chi_m\vec{H}$ $\quad \vec{B} = \mu\vec{H}$

$\vec{M} = C\dfrac{\vec{B}}{T}$ $\quad \mu = \mu_0(1 + \chi_m)$

$M = \mu/V$ $\quad H = nI$ $\quad U_L = \dfrac{1}{2}LI^2$ $\quad L = \mu_0 A\ell n^2$ $\quad L = \dfrac{\mu_0\ell}{2\pi}\ln\dfrac{R_2}{R_1}$ $\quad u_B = \dfrac{U_B}{V} = \dfrac{1}{2}\dfrac{B^2}{\mu_0}$

$\dfrac{\mathcal{E}_1}{\mathcal{E}_2} = \dfrac{N_1}{N_2} = \dfrac{V_{01}}{V_{02}}$ $\quad \mathcal{E} = V_0\sin(\omega t)$ $\quad \vec{\mu}_{orbital} = -\dfrac{e}{2m}\vec{L}$ $\quad B = \dfrac{\mu_0\mu}{2\pi d^3}$ $\quad \vec{\tau} = \vec{R}\times\vec{F}$ $\quad \vec{L} = \vec{r}\times\vec{p}$ $\quad \vec{B} = \dfrac{\mu_0}{4\pi}\dfrac{1}{r^3}[3(\vec{\mu}\cdot\hat{r})\hat{r} - \vec{\mu}]$

$PV = nRT = Nk_BT$ $\quad \rho = \rho_0[1 + \alpha(T - T_0)]$ $\quad K.E._{ave} = \dfrac{3}{2}k_BT$ $\quad P_{ave} = \dfrac{1}{2}\dfrac{V_{max}^2}{R}$ $\quad F = \mu\dfrac{\partial B}{\partial z}$

$(1+x)^{-1} = 1 - x + x^2 - x^3 + x^4 - \cdots$ $\quad (1+x)^{+1/2} = 1 + \frac{1}{2}x - \frac{1}{8}x^2 + \frac{1}{16}x^3 - \cdots$ $\quad e^x = 1 + x + \frac{1}{2}x^2 + \frac{1}{6}x^3 + \cdots$

$\ln(1+x) = x - \frac{1}{2}x^2 + \frac{1}{3}x^3 - \frac{1}{4}x^4 + \cdots$

$(1+x)^{-2} = 1 - 2x + 3x^2 - 4x^3 + 5x^4 - \cdots$ $\quad (1+x)^{-1/2} = 1 - \frac{1}{2}x + \frac{3}{8}x^2 - \frac{5}{16}x^3 + \cdots$ $\quad \sin x = x - \frac{1}{3!}x^3 + \frac{1}{5!}x^5 - \frac{1}{7!}x^7 + \cdots$

$(1+x)^{-3} = 1 - 3x + 6x^2 - 10x^3 + 15x^4 - \cdots$ $\quad (1+x)^{-1/3} = 1 - \frac{1}{3}x + \frac{2}{9}x^2 - \frac{14}{81}x^3 + \cdots$ $\quad \cos x = 1 - \frac{1}{2!}x^2 + \frac{1}{4!}x^4 - \frac{1}{6!}x^6 + \cdots$