1 Sebastian's math test

The default math mode font is *Math Italic*. This should not be confused with ordinary *Text Italic* – notice the different spacing ! `\mathbf` produces bold roman letters: **abcABC**. If you wish to embolden complete formulas, use the `\boldmath` command *before* going into math mode. This changes the default math fonts to bold.

`normal`	$x = 2\pi \Rightarrow x \simeq 6.28$
`mathbf`	$\mathbf{x} = 2\pi \Rightarrow \mathbf{x} \simeq 6.28$
`boldmath`	$\boldsymbol{x = 2\pi \Rightarrow x \simeq 6.28}$

Greek is available in upper and lower case: $\alpha, \beta \ldots \Omega$, and there are special symbols such as $\hbar$ (compare to h). Digits in formulas $1, 2, 3 \ldots$ may differ from those in text: 4, 5, 6...

There is Sans Serif alphabet $\mathsf{abcdeABCD}$ selected by `\mathsf` and Typewriter math $\mathtt{abcdeABCD}$ selected by `\mathtt`.

There is a calligraphic alphabet `\mathcal` for upper case letters $\mathcal{ABCDE} \ldots$, and there are letters for number sets: $\mathbb{A} \ldots \mathbb{Z}$, which are produced using `\mathbb`. There are Fraktur letters $\mathfrak{abcdeABCDE}$ produced using `\mathfrak`

$$\sigma(t) = \frac{1}{\sqrt{2\pi}} \int_0^t e^{-x^2/2} dx \tag{1}$$

$$\prod_{j \geq 0} \left(\sum_{k \geq 0} a_{jk} z^k \right) = \sum_{k \geq 0} z^n \left(\sum_{\substack{k_0, k_1, \ldots \geq 0 \\ k_0 + k_1 + \ldots = n}} a_0 k_0 a_{1k_1} \ldots \right) \tag{2}$$

$$\pi(n) = \sum_{m=2}^{n} \left\lfloor \left(\sum_{k=1}^{m-1} \lfloor (m/k) / \lceil m/k \rceil \rfloor \right)^{-1} \right\rfloor \tag{3}$$

$$\{ \underbrace{ \overbrace{a, \ldots, a}^{k\ a's}, \overbrace{b, \ldots, b}^{l\ b's} }_{k+l \text{ elements}} \} \tag{4}$$

$$\mathrm{W}^+ \begin{array}{l} \nearrow \mu^+ + \nu_\mu \\ \rightarrow \pi^+ + \pi^0 \\ \rightarrow \kappa^+ + \pi^0 \\ \searrow \mathrm{e}^+ + \nu_{\mathrm{e}} \end{array}$$

$$\frac{\pm \begin{vmatrix} x_1 - x_2 & y_1 - y_2 & z_1 - z_2 \\ l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \end{vmatrix}}{\sqrt{\begin{vmatrix} l_1 & m_1 \\ l_2 & m_2 \end{vmatrix}^2 + \begin{vmatrix} m_1 & n_1 \\ n_1 & l_1 \end{vmatrix}^2 + \begin{vmatrix} m_2 & n_2 \\ n_2 & l_2 \end{vmatrix}^2}}$$

2 Math Tests

Math test are taken from[1].

2.1 Math Alphabets

Math Italic (`\mathnormal`)

$A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z,$
$a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, \imath, \jmath,$
$A, B, \mathit{\Gamma}, \mathit{\Delta}, E, Z, H, \mathit{\Theta}, I, K, \mathit{\Lambda}, M, N, \mathit{\Xi}, O, \mathit{\Pi}, P, \mathit{\Sigma}, T, \mathit{\Upsilon}, \mathit{\Phi}, X, \mathit{\Psi}, \mathit{\Omega},$
$\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, o, \pi, \rho, \sigma, \tau, \upsilon, \phi, \chi, \psi, \omega, \varepsilon, \vartheta, \varpi, \varrho, \varsigma, \varphi, \ell, \wp,$

Math Roman (`\mathrm`)

$\mathrm{0, 1, 2, 3, 4, 5, 6, 7, 8, 9},$
$\mathrm{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z},$
$\mathrm{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, \imath, \jmath,$
$\mathrm{A, B}, \Gamma, \Delta, \mathrm{E, Z, H}, \Theta, \mathrm{I, K}, \Lambda, \mathrm{M, N}, \Xi, \mathrm{O}, \Pi, \mathrm{P}, \Sigma, \mathrm{T}, \Upsilon, \Phi, \mathrm{X}, \Psi, \Omega,$
$\alpha, \beta, \gamma, \delta, \epsilon, \zeta, \eta, \theta, \iota, \kappa, \lambda, \mu, \nu, \xi, \mathrm{o}, \pi, \rho, \sigma, \tau, \upsilon, \phi, \chi, \psi, \omega, \varepsilon, \vartheta, \varpi, \varrho, \varsigma, \varphi, \ell, \wp,$

Math Bold (`\mathbf`)

$\mathbf{0, 1, 2, 3, 4, 5, 6, 7, 8, 9},$
$\mathbf{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z},$
$\mathbf{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, \imath, \jmath,$

Math Sans Serif (`\mathsf`)

$\mathsf{0, 1, 2, 3, 4, 5, 6, 7, 8, 9},$
$\mathsf{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z},$
$\mathsf{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, \imath, \jmath,$

Caligraphic (`\mathcal`)

$\mathcal{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z},$

Fraktur (`\mathfrak`)

$\mathfrak{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z},$
$\mathfrak{a, b, c, d, e, f, g, h, i, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z}, \imath, \jmath,$

Blackboard Bold (`\mathbb`)

$\mathbb{A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z},$

2.2 Character Sidebearings

$|A| + |B| + |C| + |D| + |E| + |F| + |G| + |H| + |I| + |J| + |K| + |L| + |M| +$
$|N| + |O| + |P| + |Q| + |R| + |S| + |T| + |U| + |V| + |W| + |X| + |Y| + |Z| +$
$|a| + |b| + |c| + |d| + |e| + |f| + |g| + |h| + |i| + |j| + |k| + |l| + |m| +$
$|n| + |o| + |p| + |q| + |r| + |s| + |t| + |u| + |v| + |w| + |x| + |y| + |z| + |\imath| + |\jmath| +$
$|A| + |B| + |\Gamma| + |\Delta| + |E| + |Z| + |H| + |\Theta| + |I| + |K| + |\Lambda| + |M| +$
$|N| + |\Xi| + |O| + |\Pi| + |P| + |\Sigma| + |T| + |\Upsilon| + |\Phi| + |X| + |\Psi| + |\Omega| +$
$|\alpha| + |\beta| + |\gamma| + |\delta| + |\epsilon| + |\zeta| + |\eta| + |\theta| + |\iota| + |\kappa| + |\lambda| + |\mu| +$
$|\nu| + |\xi| + |o| + |\pi| + |\rho| + |\sigma| + |\tau| + |\upsilon| + |\phi| + |\chi| + |\psi| + |\omega| +$
$|\varepsilon| + |\vartheta| + |\varpi| + |\varrho| + |\varsigma| + |\varphi| + |\ell| + |\wp| +$

$|\mathrm{A}| + |\mathrm{B}| + |\mathrm{C}| + |\mathrm{D}| + |\mathrm{E}| + |\mathrm{F}| + |\mathrm{G}| + |\mathrm{H}| + |\mathrm{I}| + |\mathrm{J}| + |\mathrm{K}| + |\mathrm{L}| + |\mathrm{M}| +$
$|\mathrm{N}| + |\mathrm{O}| + |\mathrm{P}| + |\mathrm{Q}| + |\mathrm{R}| + |\mathrm{S}| + |\mathrm{T}| + |\mathrm{U}| + |\mathrm{V}| + |\mathrm{W}| + |\mathrm{X}| + |\mathrm{Y}| + |\mathrm{Z}| +$
$|\mathrm{a}| + |\mathrm{b}| + |\mathrm{c}| + |\mathrm{d}| + |\mathrm{e}| + |\mathrm{f}| + |\mathrm{g}| + |\mathrm{h}| + |\mathrm{i}| + |\mathrm{j}| + |\mathrm{k}| + |\mathrm{l}| + |\mathrm{m}| +$
$|\mathrm{n}| + |\mathrm{o}| + |\mathrm{p}| + |\mathrm{q}| + |\mathrm{r}| + |\mathrm{s}| + |\mathrm{t}| + |\mathrm{u}| + |\mathrm{v}| + |\mathrm{w}| + |\mathrm{x}| + |\mathrm{y}| + |\mathrm{z}| + |\imath| + |\jmath| +$
$|\mathrm{A}| + |\mathrm{B}| + |\Gamma| + |\Delta| + |\mathrm{E}| + |\mathrm{Z}| + |\mathrm{H}| + |\Theta| + |\mathrm{I}| + |\mathrm{K}| + |\Lambda| + |\mathrm{M}| +$
$|\mathrm{N}| + |\Xi| + |\mathrm{O}| + |\Pi| + |\mathrm{P}| + |\Sigma| + |\mathrm{T}| + |\Upsilon| + |\Phi| + |\mathrm{X}| + |\Psi| + |\Omega| +$

$|\mathcal{A}| + |\mathcal{B}| + |\mathcal{C}| + |\mathcal{D}| + |\mathcal{E}| + |\mathcal{F}| + |\mathcal{G}| + |\mathcal{H}| + |\mathcal{I}| + |\mathcal{J}| + |\mathcal{K}| + |\mathcal{L}| + |\mathcal{M}| +$
$|\mathcal{N}| + |\mathcal{O}| + |\mathcal{P}| + |\mathcal{Q}| + |\mathcal{R}| + |\mathcal{S}| + |\mathcal{T}| + |\mathcal{U}| + |\mathcal{V}| + |\mathcal{W}| + |\mathcal{X}| + |\mathcal{Y}| + |\mathcal{Z}| +$

2.3 Superscript positioning

$A^2 + B^2 + C^2 + D^2 + E^2 + F^2 + G^2 + H^2 + I^2 + J^2 + K^2 + L^2 + M^2 +$
$N^2 + O^2 + P^2 + Q^2 + R^2 + S^2 + T^2 + U^2 + V^2 + W^2 + X^2 + Y^2 + Z^2 +$
$a^2 + b^2 + c^2 + d^2 + e^2 + f^2 + g^2 + h^2 + i^2 + j^2 + k^2 + l^2 + m^2 +$
$n^2 + o^2 + p^2 + q^2 + r^2 + s^2 + t^2 + u^2 + v^2 + w^2 + x^2 + y^2 + z^2 + \imath^2 + \jmath^2 +$
$A^2 + B^2 + \Gamma^2 + \Delta^2 + E^2 + Z^2 + H^2 + \Theta^2 + I^2 + K^2 + \Lambda^2 + M^2 +$
$N^2 + \Xi^2 + O^2 + \Pi^2 + P^2 + \Sigma^2 + T^2 + \Upsilon^2 + \Phi^2 + X^2 + \Psi^2 + \Omega^2 +$
$\alpha^2 + \beta^2 + \gamma^2 + \delta^2 + \epsilon^2 + \zeta^2 + \eta^2 + \theta^2 + \iota^2 + \kappa^2 + \lambda^2 + \mu^2 +$
$\nu^2 + \xi^2 + o^2 + \pi^2 + \rho^2 + \sigma^2 + \tau^2 + \upsilon^2 + \phi^2 + \chi^2 + \psi^2 + \omega^2 +$
$\varepsilon^2 + \vartheta^2 + \varpi^2 + \varrho^2 + \varsigma^2 + \varphi^2 + \ell^2 + \wp^2 +$

$\mathrm{A}^2 + \mathrm{B}^2 + \mathrm{C}^2 + \mathrm{D}^2 + \mathrm{E}^2 + \mathrm{F}^2 + \mathrm{G}^2 + \mathrm{H}^2 + \mathrm{I}^2 + \mathrm{J}^2 + \mathrm{K}^2 + \mathrm{L}^2 + \mathrm{M}^2 +$
$\mathrm{N}^2 + \mathrm{O}^2 + \mathrm{P}^2 + \mathrm{Q}^2 + \mathrm{R}^2 + \mathrm{S}^2 + \mathrm{T}^2 + \mathrm{U}^2 + \mathrm{V}^2 + \mathrm{W}^2 + \mathrm{X}^2 + \mathrm{Y}^2 + \mathrm{Z}^2 +$
$\mathrm{a}^2 + \mathrm{b}^2 + \mathrm{c}^2 + \mathrm{d}^2 + \mathrm{e}^2 + \mathrm{f}^2 + \mathrm{g}^2 + \mathrm{h}^2 + \mathrm{i}^2 + \mathrm{j}^2 + \mathrm{k}^2 + \mathrm{l}^2 + \mathrm{m}^2 +$
$\mathrm{n}^2 + \mathrm{o}^2 + \mathrm{p}^2 + \mathrm{q}^2 + \mathrm{r}^2 + \mathrm{s}^2 + \mathrm{t}^2 + \mathrm{u}^2 + \mathrm{v}^2 + \mathrm{w}^2 + \mathrm{x}^2 + \mathrm{y}^2 + \mathrm{z}^2 + \imath^2 + \jmath^2 +$
$\mathrm{A}^2 + \mathrm{B}^2 + \Gamma^2 + \Delta^2 + \mathrm{E}^2 + \mathrm{Z}^2 + \mathrm{H}^2 + \Theta^2 + \mathrm{I}^2 + \mathrm{K}^2 + \Lambda^2 + \mathrm{M}^2 +$
$\mathrm{N}^2 + \Xi^2 + \mathrm{O}^2 + \Pi^2 + \mathrm{P}^2 + \Sigma^2 + \mathrm{T}^2 + \Upsilon^2 + \Phi^2 + \mathrm{X}^2 + \Psi^2 + \Omega^2 +$

$\mathcal{A}^2 + \mathcal{B}^2 + \mathcal{C}^2 + \mathcal{D}^2 + \mathcal{E}^2 + \mathcal{F}^2 + \mathcal{G}^2 + \mathcal{H}^2 + \mathcal{I}^2 + \mathcal{J}^2 + \mathcal{K}^2 + \mathcal{L}^2 + \mathcal{M}^2 +$
$\mathcal{N}^2 + \mathcal{O}^2 + \mathcal{P}^2 + \mathcal{Q}^2 + \mathcal{R}^2 + \mathcal{S}^2 + \mathcal{T}^2 + \mathcal{U}^2 + \mathcal{V}^2 + \mathcal{W}^2 + \mathcal{X}^2 + \mathcal{Y}^2 + \mathcal{Z}^2 +$

2.4 Subscript positioning

$$A_i + B_i + C_i + D_i + E_i + F_i + G_i + H_i + I_i + J_i + K_i + L_i + M_i +$$
$$N_i + O_i + P_i + Q_i + R_i + S_i + T_i + U_i + V_i + W_i + X_i + Y_i + Z_i +$$
$$a_i + b_i + c_i + d_i + e_i + f_i + g_i + h_i + i_i + j_i + k_i + l_i + m_i +$$
$$n_i + o_i + p_i + q_i + r_i + s_i + t_i + u_i + v_i + w_i + x_i + y_i + z_i + \imath_i + \jmath_i +$$
$$A_i + B_i + \mathit{\Gamma}_i + \mathit{\Delta}_i + E_i + Z_i + H_i + \mathit{\Theta}_i + I_i + K_i + \mathit{\Lambda}_i + M_i +$$
$$N_i + \mathit{\Xi}_i + O_i + \mathit{\Pi}_i + P_i + \mathit{\Sigma}_i + T_i + \mathit{\Upsilon}_i + \mathit{\Phi}_i + X_i + \mathit{\Psi}_i + \mathit{\Omega}_i +$$
$$\alpha_i + \beta_i + \gamma_i + \delta_i + \epsilon_i + \zeta_i + \eta_i + \theta_i + \iota_i + \kappa_i + \lambda_i + \mu_i +$$
$$\nu_i + \xi_i + o_i + \pi_i + \rho_i + \sigma_i + \tau_i + \upsilon_i + \phi_i + \chi_i + \psi_i + \omega_i +$$
$$\varepsilon_i + \vartheta_i + \varpi_i + \varrho_i + \varsigma_i + \varphi_i + \ell_i + \wp_i +$$

$$\mathrm{A}_i + \mathrm{B}_i + \mathrm{C}_i + \mathrm{D}_i + \mathrm{E}_i + \mathrm{F}_i + \mathrm{G}_i + \mathrm{H}_i + \mathrm{I}_i + \mathrm{J}_i + \mathrm{K}_i + \mathrm{L}_i + \mathrm{M}_i +$$
$$\mathrm{N}_i + \mathrm{O}_i + \mathrm{P}_i + \mathrm{Q}_i + \mathrm{R}_i + \mathrm{S}_i + \mathrm{T}_i + \mathrm{U}_i + \mathrm{V}_i + \mathrm{W}_i + \mathrm{X}_i + \mathrm{Y}_i + \mathrm{Z}_i +$$
$$\mathrm{a}_i + \mathrm{b}_i + \mathrm{c}_i + \mathrm{d}_i + \mathrm{e}_i + \mathrm{f}_i + \mathrm{g}_i + \mathrm{h}_i + \mathrm{i}_i + \mathrm{j}_i + \mathrm{k}_i + \mathrm{l}_i + \mathrm{m}_i +$$
$$\mathrm{n}_i + \mathrm{o}_i + \mathrm{p}_i + \mathrm{q}_i + \mathrm{r}_i + \mathrm{s}_i + \mathrm{t}_i + \mathrm{u}_i + \mathrm{v}_i + \mathrm{w}_i + \mathrm{x}_i + \mathrm{y}_i + \mathrm{z}_i + \imath_i + \jmath_i +$$
$$\mathrm{A}_i + \mathrm{B}_i + \Gamma_i + \Delta_i + \mathrm{E}_i + \mathrm{Z}_i + \mathrm{H}_i + \Theta_i + \mathrm{I}_i + \mathrm{K}_i + \Lambda_i + \mathrm{M}_i +$$
$$\mathrm{N}_i + \Xi_i + \mathrm{O}_i + \Pi_i + \mathrm{P}_i + \Sigma_i + \mathrm{T}_i + \Upsilon_i + \Phi_i + \mathrm{X}_i + \Psi_i + \Omega_i +$$

$$\mathcal{A}_i + \mathcal{B}_i + \mathcal{C}_i + \mathcal{D}_i + \mathcal{E}_i + \mathcal{F}_i + \mathcal{G}_i + \mathcal{H}_i + \mathcal{I}_i + \mathcal{J}_i + \mathcal{K}_i + \mathcal{L}_i + \mathcal{M}_i +$$
$$\mathcal{N}_i + \mathcal{O}_i + \mathcal{P}_i + \mathcal{Q}_i + \mathcal{R}_i + \mathcal{S}_i + \mathcal{T}_i + \mathcal{U}_i + \mathcal{V}_i + \mathcal{W}_i + \mathcal{X}_i + \mathcal{Y}_i + \mathcal{Z}_i +$$

2.5 Accent positioning

$\hat{A}+\hat{B}+\hat{C}+\hat{D}+\hat{E}+\hat{F}+\hat{G}+\hat{H}+\hat{I}+\hat{J}+\hat{K}+\hat{L}+\hat{M}+$
$\hat{N}+\hat{O}+\hat{P}+\hat{Q}+\hat{R}+\hat{S}+\hat{T}+\hat{U}+\hat{V}+\hat{W}+\hat{X}+\hat{Y}+\hat{Z}+$
$\hat{a}+\hat{b}+\hat{c}+\hat{d}+\hat{e}+\hat{f}+\hat{g}+\hat{h}+\hat{i}+\hat{j}+\hat{k}+\hat{l}+\hat{m}+$
$\hat{n}+\hat{o}+\hat{p}+\hat{q}+\hat{r}+\hat{s}+\hat{t}+\hat{u}+\hat{v}+\hat{w}+\hat{x}+\hat{y}+\hat{z}+\hat{\imath}+\hat{\jmath}+$
$\hat{A}+\hat{B}+\hat{\Gamma}+\hat{\Delta}+\hat{E}+\hat{Z}+\hat{H}+\hat{\Theta}+\hat{I}+\hat{K}+\hat{\Lambda}+\hat{M}+$
$\hat{N}+\hat{\Xi}+\hat{O}+\hat{\Pi}+\hat{P}+\hat{\Sigma}+\hat{T}+\hat{\Upsilon}+\hat{\Phi}+\hat{X}+\hat{\Psi}+\hat{\Omega}+$
$\hat{\alpha}+\hat{\beta}+\hat{\gamma}+\hat{\delta}+\hat{\epsilon}+\hat{\zeta}+\hat{\eta}+\hat{\theta}+\hat{\iota}+\hat{\kappa}+\hat{\lambda}+\hat{\mu}+$
$\hat{\nu}+\hat{\xi}+\hat{o}+\hat{\pi}+\hat{\rho}+\hat{\sigma}+\hat{\tau}+\hat{\upsilon}+\hat{\phi}+\hat{\chi}+\hat{\psi}+\hat{\omega}+$
$\hat{\varepsilon}+\hat{\vartheta}+\hat{\varpi}+\hat{\varrho}+\hat{\varsigma}+\hat{\varphi}+\hat{\ell}+\hat{\wp}+$

$\hat{\mathrm{A}}+\hat{\mathrm{B}}+\hat{\mathrm{C}}+\hat{\mathrm{D}}+\hat{\mathrm{E}}+\hat{\mathrm{F}}+\hat{\mathrm{G}}+\hat{\mathrm{H}}+\hat{\mathrm{I}}+\hat{\mathrm{J}}+\hat{\mathrm{K}}+\hat{\mathrm{L}}+\hat{\mathrm{M}}+$
$\hat{\mathrm{N}}+\hat{\mathrm{O}}+\hat{\mathrm{P}}+\hat{\mathrm{Q}}+\hat{\mathrm{R}}+\hat{\mathrm{S}}+\hat{\mathrm{T}}+\hat{\mathrm{U}}+\hat{\mathrm{V}}+\hat{\mathrm{W}}+\hat{\mathrm{X}}+\hat{\mathrm{Y}}+\hat{\mathrm{Z}}+$
$\hat{\mathrm{a}}+\hat{\mathrm{b}}+\hat{\mathrm{c}}+\hat{\mathrm{d}}+\hat{\mathrm{e}}+\hat{\mathrm{f}}+\hat{\mathrm{g}}+\hat{\mathrm{h}}+\hat{\mathrm{i}}+\hat{\mathrm{j}}+\hat{\mathrm{k}}+\hat{\mathrm{l}}+\hat{\mathrm{m}}+$
$\hat{\mathrm{n}}+\hat{\mathrm{o}}+\hat{\mathrm{p}}+\hat{\mathrm{q}}+\hat{\mathrm{r}}+\hat{\mathrm{s}}+\hat{\mathrm{t}}+\hat{\mathrm{u}}+\hat{\mathrm{v}}+\hat{\mathrm{w}}+\hat{\mathrm{x}}+\hat{\mathrm{y}}+\hat{\mathrm{z}}+\hat{\imath}+\hat{\jmath}+$

$\hat{\mathcal{A}}+\hat{\mathcal{B}}+\hat{\mathcal{C}}+\hat{\mathcal{D}}+\hat{\mathcal{E}}+\hat{\mathcal{F}}+\hat{\mathcal{G}}+\hat{\mathcal{H}}+\hat{\mathcal{I}}+\hat{\mathcal{J}}+\hat{\mathcal{K}}+\hat{\mathcal{L}}+\hat{\mathcal{M}}+$
$\hat{\mathcal{N}}+\hat{\mathcal{O}}+\hat{\mathcal{P}}+\hat{\mathcal{Q}}+\hat{\mathcal{R}}+\hat{\mathcal{S}}+\hat{\mathcal{T}}+\hat{\mathcal{U}}+\hat{\mathcal{V}}+\hat{\mathcal{W}}+\hat{\mathcal{X}}+\hat{\mathcal{Y}}+\hat{\mathcal{Z}}+$

2.6 Differentials

$$dA + dB + dC + dD + dE + dF + dG + dH + dI + dJ + dK + dL + dM +$$
$$dN + dO + dP + dQ + dR + dS + dT + dU + dV + dW + dX + dY + dZ +$$
$$da + db + dc + dd + de + df + dg + dh + di + dj + dk + dl + dm +$$
$$dn + do + dp + dq + dr + ds + dt + du + dv + dw + dx + dy + dz + d\imath + d\jmath +$$
$$dA + dB + d\Gamma + d\Delta + dE + dZ + dH + d\Theta + dI + dK + d\Lambda + dM +$$
$$dN + d\Xi + dO + d\Pi + dP + d\Sigma + dT + d\Upsilon + d\Phi + dX + d\Psi + d\Omega +$$
$$d\alpha + d\beta + d\gamma + d\delta + d\epsilon + d\zeta + d\eta + d\theta + d\iota + d\kappa + d\lambda + d\mu +$$
$$d\nu + d\xi + do + d\pi + d\rho + d\sigma + d\tau + d\upsilon + d\phi + d\chi + d\psi + d\omega +$$
$$d\varepsilon + d\vartheta + d\varpi + d\varrho + d\varsigma + d\varphi + d\ell + d\wp +$$
$$d\mathrm{A} + d\mathrm{B} + d\Gamma + d\Delta + d\mathrm{E} + d\mathrm{Z} + d\mathrm{H} + d\Theta + d\mathrm{I} + d\mathrm{K} + d\Lambda + d\mathrm{M} +$$
$$d\mathrm{N} + d\Xi + d\mathrm{O} + d\Pi + d\mathrm{P} + d\Sigma + d\mathrm{T} + d\Upsilon + d\Phi + d\mathrm{X} + d\Psi + d\Omega +$$

$$\mathrm{d}A + \mathrm{d}B + \mathrm{d}C + \mathrm{d}D + \mathrm{d}E + \mathrm{d}F + \mathrm{d}G + \mathrm{d}H + \mathrm{d}I + \mathrm{d}J + \mathrm{d}K + \mathrm{d}L + \mathrm{d}M +$$
$$\mathrm{d}N + \mathrm{d}O + \mathrm{d}P + \mathrm{d}Q + \mathrm{d}R + \mathrm{d}S + \mathrm{d}T + \mathrm{d}U + \mathrm{d}V + \mathrm{d}W + \mathrm{d}X + \mathrm{d}Y + \mathrm{d}Z +$$
$$\mathrm{d}a + \mathrm{d}b + \mathrm{dc} + \mathrm{d}d + \mathrm{d}e + \mathrm{d}f + \mathrm{dg} + \mathrm{d}h + \mathrm{di} + \mathrm{d}j + \mathrm{d}k + \mathrm{d}l + \mathrm{d}m +$$
$$\mathrm{d}n + \mathrm{d}o + \mathrm{d}p + \mathrm{d}q + \mathrm{d}r + \mathrm{d}s + \mathrm{d}t + \mathrm{d}u + \mathrm{d}v + \mathrm{d}w + \mathrm{dx} + \mathrm{dy} + \mathrm{dz} + \mathrm{d}\imath + \mathrm{d}\jmath +$$
$$\mathrm{d}A + \mathrm{d}B + \mathrm{d}\Gamma + \mathrm{d}\Delta + \mathrm{d}E + \mathrm{dZ} + \mathrm{d}H + \mathrm{d}\Theta + \mathrm{d}I + \mathrm{d}K + \mathrm{d}\Lambda + \mathrm{d}M +$$
$$\mathrm{d}N + \mathrm{d}\Xi + \mathrm{d}O + \mathrm{d}\Pi + \mathrm{d}P + \mathrm{d}\Sigma + \mathrm{d}T + \mathrm{d}\Upsilon + \mathrm{d}\Phi + \mathrm{d}X + \mathrm{d}\Psi + \mathrm{d}\Omega +$$
$$\mathrm{d}\alpha + \mathrm{d}\beta + \mathrm{d}\gamma + \mathrm{d}\delta + \mathrm{d}\epsilon + \mathrm{d}\zeta + \mathrm{d}\eta + \mathrm{d}\theta + \mathrm{d}\iota + \mathrm{d}\kappa + \mathrm{d}\lambda + \mathrm{d}\mu +$$
$$\mathrm{d}\nu + \mathrm{d}\xi + \mathrm{d}o + \mathrm{d}\pi + \mathrm{d}\rho + \mathrm{d}\sigma + \mathrm{d}\tau + \mathrm{d}\upsilon + \mathrm{d}\phi + \mathrm{d}\chi + \mathrm{d}\psi + \mathrm{d}\omega +$$
$$\mathrm{d}\varepsilon + \mathrm{d}\vartheta + \mathrm{d}\varpi + \mathrm{d}\varrho + \mathrm{d}\varsigma + \mathrm{d}\varphi + \mathrm{d}\ell + \mathrm{d}\wp +$$
$$\mathrm{dA} + \mathrm{dB} + \mathrm{d}\Gamma + \mathrm{d}\Delta + \mathrm{dE} + \mathrm{dZ} + \mathrm{dH} + \mathrm{d}\Theta + \mathrm{dI} + \mathrm{dK} + \mathrm{d}\Lambda + \mathrm{dM} +$$
$$\mathrm{dN} + \mathrm{d}\Xi + \mathrm{dO} + \mathrm{d}\Pi + \mathrm{dP} + \mathrm{d}\Sigma + \mathrm{dT} + \mathrm{d}\Upsilon + \mathrm{d}\Phi + \mathrm{dX} + \mathrm{d}\Psi + \mathrm{d}\Omega +$$

$$\partial A + \partial B + \partial C + \partial D + \partial E + \partial F + \partial G + \partial H + \partial I + \partial J + \partial K + \partial L + \partial M +$$
$$\partial N + \partial O + \partial P + \partial Q + \partial R + \partial S + \partial T + \partial U + \partial V + \partial W + \partial X + \partial Y + \partial Z +$$
$$\partial a + \partial b + \partial c + \partial d + \partial e + \partial f + \partial g + \partial h + \partial i + \partial j + \partial k + \partial l + \partial m +$$
$$\partial n + \partial o + \partial p + \partial q + \partial r + \partial s + \partial t + \partial u + \partial v + \partial w + \partial x + \partial y + \partial z + \partial \imath + \partial \jmath +$$
$$\partial A + \partial B + \partial \Gamma + \partial \Delta + \partial E + \partial Z + \partial H + \partial \Theta + \partial I + \partial K + \partial \Lambda + \partial M +$$
$$\partial N + \partial \Xi + \partial O + \partial \Pi + \partial P + \partial \Sigma + \partial T + \partial \Upsilon + \partial \Phi + \partial X + \partial \Psi + \partial \Omega +$$
$$\partial \alpha + \partial \beta + \partial \gamma + \partial \delta + \partial \epsilon + \partial \zeta + \partial \eta + \partial \theta + \partial \iota + \partial \kappa + \partial \lambda + \partial \mu +$$
$$\partial \nu + \partial \xi + \partial o + \partial \pi + \partial \rho + \partial \sigma + \partial \tau + \partial \upsilon + \partial \phi + \partial \chi + \partial \psi + \partial \omega +$$
$$\partial \varepsilon + \partial \vartheta + \partial \varpi + \partial \varrho + \partial \varsigma + \partial \varphi + \partial \ell + \partial \wp +$$
$$\partial \mathrm{A} + \partial \mathrm{B} + \partial \Gamma + \partial \Delta + \partial \mathrm{E} + \partial \mathrm{Z} + \partial \mathrm{H} + \partial \Theta + \partial \mathrm{I} + \partial \mathrm{K} + \partial \Lambda + \partial \mathrm{M} +$$
$$\partial \mathrm{N} + \partial \Xi + \partial \mathrm{O} + \partial \Pi + \partial \mathrm{P} + \partial \Sigma + \partial \mathrm{T} + \partial \Upsilon + \partial \Phi + \partial \mathrm{X} + \partial \Psi + \partial \Omega +$$

2.7 Slash kerning

$$1/A + 1/B + 1/C + 1/D + 1/E + 1/F + 1/G + 1/H + 1/I + 1/J + 1/K + 1/L + 1/M +$$
$$1/N + 1/O + 1/P + 1/Q + 1/R + 1/S + 1/T + 1/U + 1/V + 1/W + 1/X + 1/Y + 1/Z +$$
$$1/a + 1/b + 1/c + 1/d + 1/e + 1/f + 1/g + 1/h + 1/i + 1/j + 1/k + 1/l + 1/m +$$
$$1/n + 1/o + 1/p + 1/q + 1/r + 1/s + 1/t + 1/u + 1/v + 1/w + 1/x + 1/y + 1/z + 1/\imath + 1/\jmath +$$
$$1/A + 1/B + 1/\Gamma + 1/\Delta + 1/E + 1/Z + 1/H + 1/\Theta + 1/I + 1/K + 1/\Lambda + 1/M +$$
$$1/N + 1/\Xi + 1/O + 1/\Pi + 1/P + 1/\Sigma + 1/T + 1/\Upsilon + 1/\Phi + 1/X + 1/\Psi + 1/\Omega +$$
$$1/\alpha + 1/\beta + 1/\gamma + 1/\delta + 1/\epsilon + 1/\zeta + 1/\eta + 1/\theta + 1/\iota + 1/\kappa + 1/\lambda + 1/\mu +$$
$$1/\nu + 1/\xi + 1/o + 1/\pi + 1/\rho + 1/\sigma + 1/\tau + 1/\upsilon + 1/\phi + 1/\chi + 1/\psi + 1/\omega +$$
$$1/\varepsilon + 1/\vartheta + 1/\varpi + 1/\varrho + 1/\varsigma + 1/\varphi + 1/\ell + 1/\wp +$$

$$A/2 + B/2 + C/2 + D/2 + E/2 + F/2 + G/2 + H/2 + I/2 + J/2 + K/2 + L/2 + M/2 +$$
$$N/2 + O/2 + P/2 + Q/2 + R/2 + S/2 + T/2 + U/2 + V/2 + W/2 + X/2 + Y/2 + Z/2 +$$
$$a/2 + b/2 + c/2 + d/2 + e/2 + f/2 + g/2 + h/2 + i/2 + j/2 + k/2 + l/2 + m/2 +$$
$$n/2 + o/2 + p/2 + q/2 + r/2 + s/2 + t/2 + u/2 + v/2 + w/2 + x/2 + y/2 + z/2 + \imath/2 + \jmath/2 +$$
$$A/2 + B/2 + \Gamma/2 + \Delta/2 + E/2 + Z/2 + H/2 + \Theta/2 + I/2 + K/2 + \Lambda/2 + M/2 +$$
$$N/2 + \Xi/2 + O/2 + \Pi/2 + P/2 + \Sigma/2 + T/2 + \Upsilon/2 + \Phi/2 + X/2 + \Psi/2 + \Omega/2 +$$
$$\alpha/2 + \beta/2 + \gamma/2 + \delta/2 + \epsilon/2 + \zeta/2 + \eta/2 + \theta/2 + \iota/2 + \kappa/2 + \lambda/2 + \mu/2 +$$
$$\nu/2 + \xi/2 + o/2 + \pi/2 + \rho/2 + \sigma/2 + \tau/2 + \upsilon/2 + \phi/2 + \chi/2 + \psi/2 + \omega/2 +$$
$$\varepsilon/2 + \vartheta/2 + \varpi/2 + \varrho/2 + \varsigma/2 + \varphi/2 + \ell/2 + \wp/2 +$$

2.8 Big operators

$$\sum_{i=1}^{n} x^n \quad \prod_{i=1}^{n} x^n \quad \coprod_{i=1}^{n} x^n \quad \int_{i=1}^{n} x^n \quad \oint_{i=1}^{n} x^n$$

$$\bigotimes_{i=1}^{n} x^n \quad \bigoplus_{i=1}^{n} x^n \quad \bigodot_{i=1}^{n} x^n \quad \bigwedge_{i=1}^{n} x^n \quad \bigvee_{i=1}^{n} x^n \quad \biguplus_{i=1}^{n} x^n \quad \bigcup_{i=1}^{n} x^n \quad \bigcap_{i=1}^{n} x^n \quad \bigsqcup_{i=1}^{n} x^n$$

2.9 Radicals

$$\sqrt{x+y} \quad \sqrt{x^2+y^2} \quad \sqrt{x_i^2+y_j^2} \quad \sqrt{\left(\frac{\cos x}{2}\right)} \quad \sqrt{\left(\frac{\sin x}{2}\right)}$$

$$\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{\sqrt{x+y}}}}}}}$$

2.10 Over- and underbraces

$$\overbrace{x} \quad \overbrace{x+y} \quad \overbrace{x^2+y^2} \quad \overbrace{x_i^2+y_j^2} \quad \underbrace{x} \quad \underbrace{x+y} \quad \underbrace{x_i+y_j} \quad \underbrace{x_i^2+y_j^2}$$

2.11 Normal and wide accents

$$\dot{x} \quad \ddot{x} \quad \vec{x} \quad \bar{x} \quad \overline{x} \quad \overline{xx} \quad \tilde{x} \quad \widetilde{x} \quad \widetilde{xx} \quad \widetilde{xxx} \quad \hat{x} \quad \widehat{x} \quad \widehat{xx} \quad \widehat{xxx}$$

2.12 Long arrows

$$\leftarrow\!\!-\!\!\rightarrow \quad \leftrightarrow \quad \longleftarrow \quad \longrightarrow \quad \longleftrightarrow \quad \Leftarrow\!\!=\!\!\Rightarrow \quad \Leftrightarrow \quad \Longleftarrow \quad \Longrightarrow \quad \Longleftrightarrow$$

2.13 Left and right delimters

$$-(f)--[f]--\lfloor f\rfloor--\lceil f\rceil--\langle f\rangle--\{f\}-$$

$$-\left(f\right)--\left[f\right]--\left\lfloor f\right\rfloor--\left\lceil f\right\rceil--\left\langle f\right\rangle--\left\{f\right\}-$$

$$-\left)f\right(--\left]f\right[--\left/f\right/--\left\backslash f\right\backslash--\left/f\right\backslash--\left\backslash f\right/-$$

2.14 Big-g-g delimters

$$-\Bigg\lfloor\bigg\lfloor\Big\lfloor\big\lfloor\lfloor-\rfloor\big\rfloor\Big\rfloor\bigg\rfloor\Bigg\rfloor- \quad -\Bigg(\bigg(\Big(\big((-)\big)\Big)\bigg)\Bigg)-$$

$$-\Bigg\lceil\bigg\lceil\Big\lceil\big\lceil\lceil-\rceil\big\rceil\Big\rceil\bigg\rceil\Bigg\rceil- \quad -\Bigg\{\bigg\{\Big\{\big\{\{-\}\big\}\Big\}\bigg\}\Bigg\}-$$

$$-\Bigg[\bigg[\Big[\big[[-]\big]\Big]\bigg]\Bigg]- \quad -\Bigg(\bigg(\Big(\big((-)\big)\Big)\bigg)\Bigg)-$$

$$-\Bigg\langle\bigg\langle\Big\langle\big\langle\langle-\rangle\big\rangle\Big\rangle\bigg\rangle\Bigg\rangle- \quad -\Bigg\lgroup\bigg\lgroup\Big\lgroup\big\lgroup-\big\rgroup\Big\rgroup\bigg\rgroup\Bigg\rgroup-$$

$$-\Bigg\uparrow\bigg\uparrow\Big\uparrow\big\uparrow\uparrow-\downarrow\big\downarrow\Big\downarrow\bigg\downarrow\Bigg\downarrow- \quad -\Bigg\Uparrow\bigg\Uparrow\Big\Uparrow\big\Uparrow\Uparrow-\Downarrow\big\Downarrow\Big\Downarrow\bigg\Downarrow\Bigg\Downarrow-$$

2.15 Symbols

This is from [2]

Symbol	Control Sequence	mathcode	Family	Hex Position
∂	partial	”0140	1	40
$\flat$	flat	”015B	1	5B
$\natural$	natural	”015C	1	5C
$\sharp$	sharp	”015D	1	5D
ℓ	ell	”0160	1	60
$\imath$	imath	”017B	1	7B
$\jmath$	jmath	”017C	1	7C
$\wp$	wp	”017D	1	7D
$\prime$	prime	”0230	2	30
∞	infty	”0231	2	31
$\triangle$	triangle	”0234	2	34
$\forall$	forall	”0238	2	38
$\exists$	exists	”0239	2	39
$\neg$	neg	”023A	2	3A
$\emptyset$	emptyset	”023B	2	3B
$\Re$	Re	”023C	2	3C
$\Im$	Im	”023D	2	3D

$\top$	top	”023E	2	3E
$\bot$	bot	”023F	2	3F
$\aleph$	aleph	”0240	2	40
∇	nabla	”0272	2	72
$\clubsuit$	clubsuit	”027C	2	7C
$\diamondsuit$	diamondsuit	”027D	2	7D
$\heartsuit$	heartsuit	”027E	2	7E
$\spadesuit$	spadesuit	”027F	2	7F
$\smallint$ $\smallint$	smallint	”1273	2	73
$\bigsqcup$	bigsqcup	”1346	3	46
$\oint$	ointop	”1348	3	48
$\bigodot$	bigodot	”134A	3	4A
$\bigoplus$	bigoplus	”134C	3	4C
$\bigotimes$	bigotimes	”134E	3	4E
$\sum$	sum	”1350	3	50
$\prod$	prod	”1351	3	51
$\int$	intop	”1352	3	52
$\bigcup$	bigcup	”1353	3	53
$\bigcap$	bigcap	”1354	3	54
$\biguplus$	biguplus	”1355	3	55
$\bigwedge$	bigwedge	”1356	3	56
$\bigvee$	bigvee	”1357	3	57
$\coprod$	coprod	”1360	3	60
$\triangleright$	triangleright	”212E	1	2E
$\triangleleft$	triangleleft	”212F	1	2F
$\star$	star	”213F	1	3F
$\cdot$	cdot	”2201	2	01
$\times$	times	”2202	2	02
$\ast$	ast	”2203	2	03
$\div$	div	”2204	2	04
$\diamond$	diamond	”2205	2	05
$\pm$	pm	”2206	2	06
$\mp$	mp	”2207	2	07
$\oplus$	oplus	”2208	2	08
$\ominus$	ominus	”2209	2	09
$\otimes$	otimes	”220A	2	0A
$\oslash$	oslash	”220B	2	0B
$\odot$	odot	”220C	2	0C
$\bigcirc$	bigcirc	”220D	2	0D
$\circ$	circ	”220E	2	0E

$\bullet$	bullet	”220F	2	0F
$\bigtriangleup$	bigtriangleup	”2234	2	34
$\bigtriangledown$	bigtriangledown	”2235	2	35
$\cup$	cup	”225B	2	5B
$\cap$	cap	”225C	2	5C
$\uplus$	uplus	”225D	2	5D
$\wedge$	wedge	”225E	2	5E
$\vee$	vee	”225F	2	5F
$\setminus$	setminus	”226E	2	6E
$\wr$	wr	”226F	2	6F
$\amalg$	amalg	”2271	2	71
$\sqcup$	sqcup	”2274	2	74
$\sqcap$	sqcap	”2275	2	75
$\dagger$	dagger	”2279	2	79
$\ddagger$	ddagger	”227A	2	7A
$\leftharpoonup$	leftharpoonup	”3128	1	28
$\leftharpoondown$	leftharpoondown	”3129	1	29
$\rightharpoonup$	rightharpoonup	”312A	1	2A
$\rightharpoondown$	rightharpoondown	”312B	1	2B
$\smile$	smile	”315E	1	5E
$\frown$	frown	”315F	1	5F
$\asymp$	asymp	”3210	2	10
$\equiv$	equiv	”3211	2	11
$\subseteq$	subseteq	”3212	2	12
$\supseteq$	supseteq	”3213	2	13
$\leq$	leq	”3214	2	14
$\geq$	geq	”3215	2	15
$\preceq$	preceq	”3216	2	16
$\succeq$	succeq	”3217	2	17
$\sim$	sim	”3218	2	18
$\approx$	approx	”3219	2	19
$\subset$	subset	”321A	2	1A
$\supset$	supset	”321B	2	1B
$\ll$	ll	”321C	2	1C
$\gg$	gg	”321D	2	1D
$\prec$	prec	”321E	2	1E
$\succ$	succ	”321F	2	1F
$\leftarrow$	leftarrow	”3220	2	20
$\rightarrow$	rightarrow	”3221	2	21
$\leftrightarrow$	leftrightarrow	”3224	2	24
$\nearrow$	nearrow	”3225	2	25
$\searrow$	searrow	”3226	2	26
$\simeq$	simeq	”3227	2	27
$\Leftarrow$	Leftarrow	”3228	2	28
$\Rightarrow$	Rightarrow	”3229	2	29
$\Leftrightarrow$	Leftrightarrow	”322C	2	2C

$\nwarrow$	nwarrow	”322D	2	2D
$\swarrow$	swarrow	”322E	2	2E
$\propto$	propto	”322F	2	2F
$\in$	in	”3232	2	32
$\ni$	ni	”3233	2	33
$/$	not	”3236	2	36
$\mapstochar$	mapstochar	”3237	2	37
$\perp$	perp	”323F	2	3F
$\vdash$	vdash	”3260	2	60
$\dashv$	dashv	”3261	2	61
$\mid$	mid	”326A	2	6A
$\parallel$	parallel	”326B	2	6B
$\sqsubseteq$	sqsubseteq	”3276	2	76
$\sqsupseteq$	sqsupseteq	”3277	2	77

2.16 Miscellanneous formulae

Taken from [3]

$$\hbar\nu = E, \qquad \hbar \neq \pi, \qquad \partial j, \qquad x^j, \qquad x^l$$

Some other other equations: $\sum^J a'$, r^a and D^k.
Let $\mathbf{A} = (a_{ij})$ be the adjacency matrix of graph G. The corresponding Kirchhoff matrix $\mathbf{K} = (k_{ij})$ is obtained from $\mathbf{A}$ by replacing in $-\mathbf{A}$ each diagonal entry by the degree of its corresponding vertex; i.e., the ith diagonal entry is identified with the degree of the ith vertex. It is well known that

$$\det \mathbf{K}(i|i) = \text{ the number of spanning trees of } G, \quad i = 1, \dots, n \tag{5}$$

where $\mathbf{K}(i|i)$ is the ith principal submatrix of $\mathbf{K}$.
Let $C_{i(j)}$ be the set of graphs obtained from G by attaching edge $(v_i v_j)$ to each spanning tree of G. Denote by $C_i = \bigcup_j C_{i(j)}$. It is obvious that the collection of Hamiltonian cycles is a subset of C_i. Note that the cardinality of C_i is $k_{ii} \det \mathbf{K}(i|i)$. Let $\widehat{X} = \{\hat{x}_1, \dots, \hat{x}_n\}$. Define multiplication for the elements of $\widehat{X}$ by

$$\hat{x}_i \hat{x}_j = \hat{x}_j \hat{x}_i, \quad \hat{x}_i^2 = 0, \quad i, j = 1, \dots, n. \tag{6}$$

Let $\hat{k}_{ij} = k_{ij}\hat{x}_j$ and $\hat{k}_{ij} = -\sum_{j \neq i} \hat{k}_{ij}$. Then the number of Hamiltonian cycles H_c is given by the relation

$$\left(\prod_{j=1}^{n} \hat{x}_j\right) H_c = \frac{1}{2}\hat{k}_{ij} \det \widehat{\mathbf{K}}(i|i), \qquad i = 1, \dots, n. \tag{7}$$

The task here is to express (7) in a form free of any $\hat{x}_i$, $i = 1, \dots, n$. The result also leads to the resolution of enumeration of Hamiltonian paths in a graph.
It is well known that the enumeration of Hamiltonian cycles and paths in a complete graph K_n and in a complete bipartite graph $K_{n_1 n_2}$ can only be found from

first combinatorial principles. One wonders if there exists a formula which can be used very efficiently to produce K_n and $K_{n_1 n_2}$. Recently, using Lagrangian methods, Goulden and Jackson have shown that H_c can be expressed in terms of the determinant and permanent of the adjacency matrix. However, the formula of Goulden and Jackson determines neither K_n nor $K_{n_1 n_2}$ effectively. In this paper, using an algebraic method, we parametrize the adjacency matrix. The resulting formula also involves the determinant and permanent, but it can easily be applied to K_n and $K_{n_1 n_2}$. In addition, we eliminate the permanent from H_c and show that H_c can be represented by a determinantal function of multivariables, each variable with domain $\{0, 1\}$. Furthermore, we show that H_c can be written by number of spanning trees of subgraphs. Finally, we apply the formulas to a complete multigraph $K_{n_1 \ldots n_p}$.
The conditions $a_{ij} = a_{ji}$, $i, j = 1, \ldots, n$, are not required in this paper. All formulas can be extended to a digraph simply by multiplying H_c by 2.
The boundedness, property of Φ_0, then yields

$$\int_{\mathcal{D}} \left|\overline{\partial} u\right|^2 e^{\alpha |z|^2} \geq c_6 \alpha \int_{\mathcal{D}} |u|^2 e^{\alpha |z|^2} + c_7 \delta^{-2} \int_A |u|^2 e^{\alpha |z|^2}.$$

Let $B(X)$ be the set of blocks of Λ_X and let $b(X) = |B(X)|$. If $\phi \in Q_X$ then ϕ is constant on the blocks of Λ_X.

$$P_X = \{\phi \in M \mid \Lambda_\phi = \Lambda_X\}, \qquad Q_X = \{\phi \in M \mid \Lambda_\phi \geq \Lambda_X\}. \tag{8}$$

If $\Lambda_\phi \geq \Lambda_X$ then $\Lambda_\phi = \Lambda_Y$ for some $Y \geq X$ so that

$$Q_X = \bigcup_{Y \geq X} P_Y.$$

Thus by Möbius inversion

$$|P_Y| = \sum_{X \geq Y} \mu(Y, X)\, |Q_X|\,.$$

Thus there is a bijection from Q_X to $W^{B(X)}$. In particular $|Q_X| = w^{b(X)}$.

$$W(\Phi) = \left\| \begin{array}{ccccc} \dfrac{\varphi}{(\varphi_1, \varepsilon_1)} & 0 & \ldots & 0 & \\ \dfrac{\varphi k_{n2}}{(\varphi_2, \varepsilon_1)} & \dfrac{\varphi}{(\varphi_2, \varepsilon_2)} & \ldots & 0 & \\ \multicolumn{5}{c}{\dotfill} \\ \dfrac{\varphi k_{n1}}{(\varphi_n, \varepsilon_1)} & \dfrac{\varphi k_{n2}}{(\varphi_n, \varepsilon_2)} & \ldots & \dfrac{\varphi k_{n\,n-1}}{(\varphi_n, \varepsilon_{n-1})} & \dfrac{\varphi}{(\varphi_n, \varepsilon_n)} \end{array} \right\|$$

References

[1] Walter Schmidt. *Using Common PostScript Fonts With LaTeX. PSNFSS Version 9.2*, September 2004. http://ctan.tug.org/tex-archive/macros/latex/required/psnfss.

[2] Victor Eijkhout. *TeX by Topic*. Lulu, 2007. http://eijkhout.net/texbytopic/texbytopic.html.

[3] Michael Downes and Barbara Beeton. *The amsart, amsproc, and amsbook document classes*. American Mathematical Society, August 2004. http://www.ctan.org/tex-archive/macros/latex/required/amslatex/classes.