Errata of Matrices in Combinatorics and Graph Theory

Chapter 1

Page	Line	Errors	Corrected Version
2	16	... matrix, then $D(A)$ is a bipartite graph.	... matrix, if and only if $D(A)$ is a bipartite graph.
3	2	$b_{ij} = \begin{cases} 1 & \text{it } v_j \text{ is an out-arc of } v_i \\ -1 & \text{it } v_j \text{ is an in-arc of } v_i \\ 0 & \text{otherwise} \end{cases}$	$b_{ij} = \begin{cases} 1 & \text{it } e_j \text{ is an out-arc of } v_i \\ -1 & \text{it } e_j \text{ is an in-arc of } v_i \\ 0 & \text{otherwise} \end{cases}$
3	4, 6	Laplace matrix	Laplacian matrix
5	-7	$r^1 + 1 \le f(r, 5) \le ...$	$r^2 + 1 \le f(r, 5) \le ...$
7	10	$k^2 + k - (r-1) = 1$	$k^2 + k - (r-1) = -1$
8	-7	$\lambda_i A = \lambda_1 \mathbf{x}_i$, $\lambda_i A_1 = \lambda_i \mathbf{x}'_i$	$A\mathbf{x}_i = \lambda_1 \mathbf{x}_i$, $A_1 \mathbf{x}'_i = \lambda_i \mathbf{x}'_i$
9	3	$...= A\mathbf{y} = (\mathbf{u}^T\mathbf{y}')\mathbf{e}_1 + \mu\mathbf{y}'$ $= (\mathbf{u}^T\mathbf{y}')\sum_{i=1}^k c_i\tilde{\mathbf{x}}_i + \mu\mathbf{y}'.$	$...= A\mathbf{y} = \begin{pmatrix} \mathbf{u}^T\mathbf{y}' \\ A_1\mathbf{y}' \end{pmatrix}$ $= (\mathbf{u}\mathbf{y}')^T\mathbf{e}_1 + \mu\mathbf{y} = (\mathbf{u}^T\mathbf{y}')\sum_{i=1}^k c_i\tilde{\mathbf{x}}_i + \mu\mathbf{y}.$
9	5	$b_j = \frac{-(\mathbf{u}^T\mathbf{y}')c_i}{\mu - \tilde{\lambda}_j}$	$b_j = \frac{-(\mathbf{u}^T\mathbf{y}')c_i}{\mu - \tilde{\lambda}_j}$
10	-8	$\lambda(H_i)$	$\lambda_2(H_i)$
11	2	$\{H_i : 12 \le i \le 4\}$	$\{H_i : 1 \le i \le 4\}$
11	7	$\{H_i : 12 \le i \le 4\}$	$\{H_i : 1 \le i \le 4\}$
11	10	$\{H_i : 12 \le i \le 5\}$	$\{H_i : 1 \le i \le 4\}$
11	-17	By Claim 1,	By Claim 2,
12	4	$\{H_i : 12 \le i \le 4\}$	$\{H_i : 1 \le i \le 4\}$
13	10-12	Again by $\mathbf{y} = \sum_{i=1}^n c_i\mathbf{x}_i$ and by $A\mathbf{x}_i = \lambda_i\mathbf{x}_i$, $\frac{(A\mathbf{y})^T\mathbf{e}_i}{\mathbf{y}^T\mathbf{e}_i} = \frac{c_i^2\lambda_i}{c_i^2} = \lambda_i \le \lambda_1,$ where equality holds if and only if $i = 1$, by Theorem 1.3.1(i). By Theorem 1.3.1(i),	By Theorem 1.3.1(i),
13	-15	$... = \frac{\sum_{i=1}^n b_i(A\mathbf{y})^T\mathbf{e}_i}{\sum_{i=1}^n b_i(\mathbf{y}^T\mathbf{x}_i)}$ $\le \max_{1\le j\le n} \frac{b_j(A\mathbf{y})^T\mathbf{e}_j}{b_j(\mathbf{y}^T\mathbf{x}_j)} \le \lambda_1,$	$... = \frac{\sum_{i=1}^n b_i(A\mathbf{y})^T\mathbf{e}_i}{b_i(\mathbf{y}^T\mathbf{e}_i)}$ $\le \max_{1\le j\le n} \frac{b_j(A\mathbf{y})^T\mathbf{e}_j}{b_j(\mathbf{y}^T\mathbf{e}_j)} \le \lambda_1,$
16	15	$\lambda_i(G) = -\lambda_{n+1-i}$	$\lambda_i(G) = -\lambda_{n+1-i}(G)$

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17	-13	If $q \geq n$,	If $q > n$,
18	3	...in Exercise 1.28(i),	...in Exercise 1.20(i),
19	12	...$B_I = (b^i_{ij})$ of D...	...$B_I = (b^I_{ij})$ of D...
19	14	(b^i_{ij})	(b^I_{ij})
20	2	$\lambda^m \det(\lambda I_n - B_O B_i^T)$ $= \lambda^n \det(\lambda I_m - B_i^T B_i)$.	$\lambda^m \det(\lambda I_n - B_O B_I^T)$ $= \lambda^n \det(\lambda I_m - B_I^T B_O)$.
20	-10	...$-n(1+\lambda)A + A^2)$	...$-I_n(1+\lambda)A + A^2)$
21	-10	... $\det(I - tA + \frac{1}{t}J)$	... $\det(I - tA + tJ)$
22	-14	... $\mathrm{tr}(A_1^k) = \sum_{i=1}^n \lambda_i(A_1)^k$...	...$\mathrm{tr}(A_1) = \sum_{i=1}^n \lambda_i^k$...
22	-13	...$\{$ $\mathrm{tr}(A_1), \cdots,$ $\mathrm{tr}A_1^n\}$...	...$\{$ $\mathrm{tr}(A_1), \cdots,$ $\mathrm{tr}(A_1^n)\}$...
25	12	...$D(G)$ is strongly connected.	...$D(B)$ is strongly connected.
25	14	...$(0,1)$ matrices with...	...symmetric $(0,1)$ matrices with...
25	16	... for all $k < l, k < i$ and $l < j$...	... for all $k < l, k < i$ and $l \leq j$...
25	-9	... $B\mathbf{x} = \rho(\mathbf{x})$...	...$A\mathbf{x} = \rho(A)\mathbf{x}$...
26	3	$x_1 \geq x_2 \geq \cdots \vec{x_n} \geq 0$.	$x_1 \geq x_2 \geq \cdots \geq x_n \geq 0$.
26	17	$(A\mathbf{x})_q = (B\mathbf{x})_q = (A\mathbf{x})_q + (\mathbf{x})_q$,	$(A\mathbf{x})_q = (B\mathbf{x})_q = (A\mathbf{x})_q + (\mathbf{x})_p$,
26	18	Therefore, $x_q = 0$, ...	Therefore, $x_p = 0$, ...
26	19	... $x_q = 0$, contrary to ... $x_q > 0$.	... $x_p = 0$, contrary to ... $x_p \neq 0$.
26	-1	... $D = (d_{ij})_{n\times n}$ be a nonnegative ...	... $D = (d_{ij})_{n\times n}$ be a nonnegative symmetric...
27	6	... such that $\rho(A)\mathbf{x} = A\mathbf{x}$.	.... such that $\rho(D)\mathbf{x} = D\mathbf{x}$.
29	-13	$\rho(A)^2 = ...$	$\rho(A)x_i^2 = ...$
31	8	$\sum_i \sum_{j:m_{ij}=0} y_j^2$...	$\sum_i r_i \sum_{j:m_{ij}=0} y_j^2$...
31	11	$\sum_i (r_i - s - i)y_i^2 - (r-1)\sum_i s_i y_i^2 + r(n-1)$...	$\sum_i (r_i - s_i)y_i^2 - (r-1)\sum_i s_i y_i^2 + r(n-1)$...
32	-10	$\rho(G) \leq \sqrt{2e - r(n-1) + (r-1)}$	$\rho(G) \leq \sqrt{2e - r(n-1) + (r-1)S}$
33	9	$= m - r\sum_i (a - S)\sum_i y_i^2 =$...	$\leq m - r\sum_i (a - S)\sum_i y_i^2 =$...
35	9	Let $e = \binom{k}{2}$ with...	Let $e = \binom{k}{2} + s$ with...
36	8	$a_{1i} \geq a_{2i} \geq \cdots \geq a_{ni}$ and ...	$a_{1i} \leq a_{2i} \leq \cdots \leq a_{ni}$ and ...
36	9	$\bar{g}(n,e) = \min\{\rho(A) \ : \ A \in \overline{\mathcal{M}}(n,r)\}$	$\bar{g}(n,r) = \min\{\rho(A) \ : \ A \in \overline{\mathcal{M}}(n,r)\}$
36	1	$\bar{g}^*(n,e) = \max\{\rho(A) \ : \ A \in \overline{\mathcal{M}}^*(n,r)\}$	$\bar{g}^*(n,r) = \min\{\rho(A) \ : \ A \in \overline{\mathcal{M}}^*(n,r)\}$
36	-8	$B \in \overline{\mathcal{M}}^*, r)$	$B \in (\overline{\mathcal{M}}^*, r)$
36	-1	$g(n,r)$	$\bar{g}(n,r)$
41	7	$A(L(G)) = B^T B - C$	$A(L(G)) = BB^T - C$
45	-9	By Theorem 1.6.5 and ...	By Theorem 1.6.4, and Theorem 1.6.5 and ...
45	-7	$(\rho(G)\rho(\bar{G}) + \dfrac{1}{2})^2$	$(\rho(G) + \rho(G^c) + \dfrac{1}{2})^2$

Chapter 2

Page	Line	Errors	Corrected Version
47	-3	Nonnegative matrices can be ...	For matrices A and B, define $A \simeq_p B$ if for some permutation matrix P, $PAP^T = B$; and $A \sim_p B$ if for some permutation matrices P and Q, $PAQ = B$. Nonnegative matrices can be ...
48	-18	(vi) $1 + A + \cdots + A^{m-1} > 0$.	(vi) $I + A + \cdots + A^{m-1} > 0$.
48	-5	Let $i_1, i_2, \cdots, i_l$, where	Let $i_1, i_2, \cdots, i_j$, where
49	-5	(Brualdi, Parter and Schneider, [35])	(Marcus, Minc, Brualdi, [199])
50	-9	...with out degree zero.	...with in degree zero.
50	-5	for $g < q \le r \le k$,	for $g < q < r \le k$,
51	-16	permuting the sth row with the tth row,	permuting the sth column with the tth column,
52	10	By Corollary 2.1.1,	By Theorem 2.1.1,
54	-17	(see Proposition 1.1.2(vii)).	(see Proposition 1.1.2(vi)).
59	6	If B in (2.7)...	If B in (2.4)...
61	13	...matchings of D.	...matchings of G.
61	-3	$\text{Per}\left(\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}\right) \neq \text{Per}\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} \text{Per}\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}.$	$\text{Per}\left(\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}\right) \neq \text{Per}\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix} \text{Per}\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}.$
64	5	$\sum_{j=0}^{m-1} \begin{pmatrix} n-m+j \\ j \end{pmatrix}$	$\sum_{j=0}^{m-1} (-1)^j \begin{pmatrix} n-m+j \\ j \end{pmatrix}$
64	9	$P_i = \{(j_1, j_2, \cdots, j_m) \in S \| i \in \{j_1, j_2, \cdots, j_m\}\}$	$P_i = \{(j_1, j_2, \cdots, j_m) \in S \| i \notin \{j_1, j_2, \cdots, j_m\}\}$
64	-12	$n \le m \le 1$	$n \ge m \ge 1$.
64	-9	... with $n \le m \ge 1$	... with $n \ge m \ge 1$.
65	8	$\text{Per}(A(i\|j)) =$	$\text{Per}(A(i\|j)) \ge$.
65	10	$\sum_{j=1}^{n} a_{ij}\ \text{Per}(A(1\|j))$	$\sum_{j=1}^{n} a_{ij}\ \text{Per}(A(i\|j))$.
65	13	$\sum_{j=1}^{n} a_{ij}\ \text{Per}(A(1\|j))$	$\sum_{j=1}^{n} a_{ij}\ \text{Per}(A(i\|j))$.
65	-3	$\text{Par}(A)$...	$\text{Per}(A)$...

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66	-5	By Lemma 2.5.3,	By Lemma 2.5.4,
66	-2	By Lemma 2.5.4,	By Lemma 2.5.3,
67	10	$\prod_{\sigma\in S}\left(\prod_{i=1}^{n}(r_i!)^{\frac{n}{r_j}}\right)$	$\prod_{\sigma\in S}\left(\prod_{i=1}^{n}(r_i!)^{\frac{n}{r_i}}\right)$
67	-6	Let $A \in M_n^+$...	Let $A \in \mathbf{B}_n$...
67	-4	$\text{per}(A) < 2^{\|A\|-2n}$.	$\text{Per}(A) \leq 2^{\|A\|-2n}+1$.
67	-3	Let $A=(a_{ij}) \in M_n^+$ be a ...	Let $A=(a_{ij}) \in M_n^+$ be an integral...
68	-10	$\text{Per}(A)=$...	$\text{Per}(A)\leq$...
71	13	$\mathbf{r}$ is increasing if ...	$\mathbf{r}$ is not increasing if ...
75	11	... $j+1 \leq k \leq n\}$ ...	... $j+1 \leq k \leq n$ ...
75	-15	Thus M has ...	Thus A has ...
82	-8	$X=(x_{i,j}) \in \Omega_n(A) \setminus \overline{\mathcal{P}(C_n)}$	$X=(x_{ij}) \in \Omega_n(A) \setminus \overline{\mathcal{P}(A)}$
83	-15	$x_{i+1,j-1}-x_{i,j-i-1}=x_{1,j}-x_{n,j-1}$,	$x_{i+1,j-i}-x_{i,j-i-1}=x_{1,j}-x_{n,j-1}$,
85	-5	$X_{s,\sigma(s)}=\sum_{P\in\mathcal{P}_l(B)} c_P P$,	$X_{s,\sigma(s)}=\sum_{P\in\mathcal{P}_k(B)} c_P P$,
86	11	if $V(G)=\cup_{i=1}^m$ is ...	$V(G)=\cup_{i=1}^m V_i$ is ...
87	5	...$b-s_1,\cdots,b-s_m$.	...$a-s_1,\cdots,a-s_m$.
87	7	...$z_{ij}+a-t_i-s_j$.	...$z_{ij}+a-r_i-s_j$.
89	5	...Then G is compact.	...Then G is supercompact.
89	14	...$B\otimes J_m$.	...$B\otimes J_k$.
94	10	$\text{Per}(A)\leq\ \text{Per}(B)+1\geq$...	$\text{Per}(A)\geq\ \text{Per}(B)+1\geq$...

Chapter 3

Page	Line	Errors	Corrected Version
98	10	$> a_1a_2 - a_1 - a_2(a_1 - 1)a_2) = -a_1$	$> a_1a_2 - a_1 - a_2 - (a_1t + a_1 - 1)a_2 + a_1a_2t = -a_1$
104	10	... a directed closed walk $W(u, v)$...	... a directed closed spanning walk $W(u, v)$...
105	11	By Lemma 3.2.2(i),	By direct matrix computation,
108	11	$\gamma(D) \leq (n-1)^2 - 1$.	$\gamma(D) \leq (n-1)^2 + 1$.
108	17	...D is isomorphic to D_i.	...D is isomorphic to D_i in Examples 3.3.1 and 3.3.2.
109	11	...from Theorem 3.2.1.	...from Theorem 3.2.2.