

# CSCI-761 HW 3

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1. 1. Graph 2 (mappings)

- 01234567
- 01324657
- 10237564
- 10327654
- 23015476
- 32106745
- 23105746
- 32016475

Graph 2 (cycle notation)

- $()$
- $(2\ 3)(5\ 6)$
- $(0\ 1)(4\ 7)$
- $(0\ 1)(2\ 3)(4\ 7)(5\ 6)$
- $(0\ 2)(1\ 3)(4\ 5)(6\ 7)$
- $(0\ 3)(1\ 2)(4\ 6)(5\ 7)$
- $(0\ 2\ 1\ 3)(4\ 5\ 7\ 6)$
- $(0\ 3\ 1\ 2)(4\ 6\ 7\ 5)$

## 2. Graph 3 (mappings)

- 01234567
- 02135476
- 10462735
- 20571634
- 41750362
- 52640371
- 74321650
- 65312740
- 37604521
- 36705412
- 63517204
- 73426105
- 56243017
- 47153026
- 25076143
- 14067253

## Graph 3 (cycle notation)

- $()$
- $(1\ 2)(4\ 5)(6\ 7)$
- $(0\ 1)(2\ 4)(3\ 6)(5\ 7)$
- $(0\ 2\ 5\ 6\ 3\ 7\ 4\ 1)$
- $(0\ 4)(2\ 7)(3\ 5)$
- $(0\ 5\ 3\ 4)(1\ 2\ 6\ 7)$
- $(0\ 7)(1\ 4)(2\ 3)(5\ 6)$
- $(0\ 6\ 4\ 2\ 3\ 1\ 5\ 7)$
- $(0\ 3)(1\ 7)(2\ 6)$
- $(0\ 3)(1\ 6)(2\ 7)(4\ 5)$
- $(0\ 6)(1\ 3)(2\ 5)(4\ 7)$
- $(0\ 7\ 5\ 1\ 3\ 2\ 4\ 6)$
- $(0\ 5)(1\ 6)(3\ 4)$
- $(0\ 4\ 3\ 5)(1\ 7\ 6\ 2)$
- $(0\ 2)(1\ 5)(3\ 7)(4\ 6)$
- $(0\ 1\ 4\ 7\ 3\ 6\ 5\ 2)$

2. 1. Upper bounds using  $R(s, t) \leq R(s, t - 1) + R(s - 1, t)$ . Cells marked in green use the strict inequality.

$t \backslash s$	2	3	4	5	6	7	8	9	10
2	2	3	4	5	6	7	8	9	10
3		6	9	14	19	26	33	42	51
4			18	31	50	75	108	149	200
5				62	111	186	293	442	641
6					222	407	700	1141	1782
7						814	1513	2654	4435
8							3026	5679	10114
9								11358	21471
10									42942

2. Upper bounds using  $R(s, s) \leq \binom{2s-2}{s-1}$ .

$s$	3	4	5	6	7	8	9	10
$R(s, s) \leq$	6	20	70	252	924	3432	12870	48620

3. Upper bounds using  $R(s, s) \leq (4 - \epsilon)^s$ , with  $\epsilon = 0.2$ .

$s$	3	4	5	6	7	8	9	10
$R(s, s) \leq$	54	208	792	3010	11441	43477	165216	627821

3. Lower bounds using  $R(s, s) > 2^{s/2}$  and the best that can be obtained numerically using  $2^{\binom{n}{s}}/2^{\binom{s}{2}} < 1$ .

$s$	3	4	5	6	7	8	9	10
$R(s, s) > 2^{s/2}$	2.8	4	5.7	8	11.3	16	22.6	32
$R(s, s) > n$ , where $2^{\binom{n}{s}}/2^{\binom{s}{2}} < 1$	3	6	11	17	27	42	65	100