

### Homework Solutions - Section 1.3

1.

- (a)  $\{0, 5, 10, 15, 20, \dots\}$
- (b)  $\{3, 5, 7, 9, 11, \dots\}$
- (c)  $\{\{\}, \{1\}, \{2\}, \{3\}, \{4\}, \{5\}, \dots\}$
- (d)  $\{1, 2, 4, 8, 16, \dots\}$
- (e)  $\{1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \dots\}$
- (f)  $\{\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{2}{3}, \frac{3}{4}, \dots\}$
- (g)  $\{1, 2, 4, 6, 10, \dots\}$

3.

- (a)  $\{\lambda, a, b, c, aa, bb, \dots\}$
- (b)  $\{\lambda, a, b, aa, ab, ba, bb\}$
- (c)  $\{aaaa, aaab, aaba, aabb, bbbb, \dots\}$

5.

- (a)  $\emptyset$
- (b)  $\emptyset$
- (c)  $\emptyset$
- (d)  $\{1, 4, 7, 10, 13, 16, 19\}$
- (e)  $\{2, 3, 5, 7, 11, 13\}$

9.

- (a)  $\infty$
- (b) 16
- (c)  $\infty$
- (d)  $\infty$
- (e)  $\infty$
- (f)  $\{2\}$
- (g)  $\infty$

11.

$$A = \{1, 3, 5, 7, 9, 11, 13, \dots\}$$

$$B = \{2, 3, 5, 7, 11, 13, 17, \dots\}$$

$$C = \{7, 11, 13, 17, 21, \dots\}$$

$$D = \{3, 5\}$$

$$A \subseteq A$$

$$B \subseteq B,$$

$$C \subseteq A, C \subseteq C$$

$$D \subseteq A, D \subseteq B, D \subseteq D$$

13.

(a) aba is in all three with a length of 3

(b) bAb is in  $\Sigma_3^*$  with a length of 2

(c) cba is in  $\Sigma_1^*$  with a length of 3

(d) cab is in  $\Sigma_1^*$  with a length of 3 and in  $\Sigma_2^*$  with a length of 2

(e) caab is in  $\Sigma_1^*$  with a length of 4 and in  $\Sigma_2^*$  with a length of 3

(e) baAb is in  $\Sigma_3^*$  with a length of 3