

Exercise 3 Section 6.3 in G & S

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Solve [

Det [{{1-2p, 2p, 0}, {p, 1-2p, p}, {0, 2p, 1-2p}} - lambda {{1, 0, 0}, {0, 1, 0}, {0, 0, 1}}] = 0,
{lambda}]

{{lambda -> 1}, {lambda -> 1-4p}, {lambda -> 1-2p}}

Solve [{{1-2p, 2p, 0}, {p, 1-2p, p}, {0, 2p, 1-2p}}.{{b11}, {b12}, {b13}} == {{b11}, {b12}, {b13}},
{b11, b12, b13}]

{{b12 -> b11, b13 -> b11}}

Solve [{{1-2p, 2p, 0}, {p, 1-2p, p}, {0, 2p, 1-2p}}.{{b21}, {b22}, {b23}} ==
(1-2p) {{b21}, {b22}, {b23}}, {b21, b22, b23}]

{{b22 -> 0, b23 -> -b21}}

Solve [{{1-2p, 2p, 0}, {p, 1-2p, p}, {0, 2p, 1-2p}}.{{b31}, {b32}, {b33}} ==
(1-4p) {{b31}, {b32}, {b33}}, {b31, b32, b33}]

{{b32 -> -b31, b33 -> b31}}

B = {{1, 1, 1}, {1, 0, -1}, {1, -1, 1}};

Simplify [B.{{1, 0, 0}, {0, 1-2p, 0}, {0, 0, 1-4p}}.Inverse[B]]

{{1-2p, 2p, 0}, {p, 1-2p, p}, {0, 2p, 1-2p}}

FullSimplify [B.{{1, 0, 0}, {0, 1-2p, 0}, {0, 0, 1-4p}}^n.Inverse[B]]

$\left\{ \left\{ \frac{1}{4} (1 + 8 \times 0^n + (1 - 4p)^n + 2(1 - 2p)^n), \frac{1}{2} + 0^{1+n} - \frac{1}{2} (1 - 4p)^n, \frac{1}{4} (1 + (1 - 4p)^n - 2(1 - 2p)^n) \right\}, \right.$
 $\left. \left\{ \frac{1}{4} + 0^{1+n} - \frac{1}{4} (1 - 4p)^n, \frac{1}{2} (1 - 2 \times 0^n + 2 \times 0^{2+n} + (1 - 4p)^n), \frac{1}{4} (1 - (1 - 4p)^n) \right\}, \right.$
 $\left. \left\{ \frac{1}{4} (1 + 4 \times 0^n + 2 \times 0^{1+n} + (1 - 4p)^n - 2(1 - 2p)^n), \right. \right.$
 $\left. \left. \frac{1}{2} + 0^{1+n} - \frac{1}{2} (1 - 4p)^n, \frac{1}{4} (1 - 4 \times 0^n + 2 \times 0^{1+n} + (1 - 4p)^n + 2(1 - 2p)^n) \right\} \right\}$