
Formula Sheet for MS0105/MS0151

Transformation Matrices

1. Reflection	
a. In the y -axis	$\begin{bmatrix} -1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
b. In the x -axis	$\begin{bmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
c. In the line $y = x$	$\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
2. Scaling relative to the origin	$\begin{bmatrix} k_x & 0 & 0 \\ 0 & k_y & 0 \\ 0 & 0 & 1 \end{bmatrix}$
3. Shearing	
a. In the x -direction	$\begin{bmatrix} 1 & s_x & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
b. In the y -direction	$\begin{bmatrix} 1 & 0 & 0 \\ s_y & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$
4. Rotation about the origin	$\begin{bmatrix} \cos \theta & -\sin \theta & 0 \\ \sin \theta & \cos \theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$
5. Translation	$\begin{bmatrix} 1 & 0 & d_x \\ 0 & 1 & d_y \\ 0 & 0 & 1 \end{bmatrix}$

Boolean Algebra

Commutative	$x \cdot y = y \cdot x$ $x + y = y + x$
Associative	$x \cdot (y \cdot z) = (x \cdot y) \cdot z = x \cdot y \cdot z$ $x + (y + z) = (x + y) + z = x + y + z$
Distributive	$x + (y \cdot z) = (x + y) \cdot (x + z)$ $x \cdot (y + z) = (x \cdot y) + (x \cdot z)$
Identity	$x \cdot 1 = x$ $x + 0 = x$
Complement	$x \cdot \bar{x} = 0$ $x + \bar{x} = 1$
Involution	$\overline{\bar{x}} = x$
Idempotent	$x \cdot x = x$ $x + x = x$
Bound	$x \cdot 0 = 0$ $x + 1 = 1$
De Morgan's	$\overline{(x \cdot y)} = \bar{x} + \bar{y}$ $\overline{(x + y)} = \bar{x} \cdot \bar{y}$
Absorption	$x \cdot (x + y) = x$ $x + (x \cdot y) = x$ $x \cdot (\bar{x} + y) = x \cdot y$ $x + (\bar{x} \cdot y) = x + y$

Probability Rules

Addition	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
Subtraction	$P(\bar{A}) = 1 - P(A)$
Multiplication	$P(A \cap B) = P(A) P(B)$ if A and B are independent events
Conditional	$P(A B) = \frac{P(A \cap B)}{P(B)}$