MAE 511 Function List

EMSSL

Below is a list of the basic functions included in the package "MazzoleniNotation" written for MAE 511 and EMSSL.

Function Syntax	**Example**	**Output**
`\AngMom{derivative-frame}{reference-point}{point}`	`\AngMom{O}{P}{A}`	$\overset{\bar{O}}{{}_{P}}\vec{h}_{A}$
`\AcclVec{derivative-frame}{point}{with-respect-to-point}`	`\AcclVec{O}{A}{Q}`	${}^{\bar{O}}\vec{a}_{A/Q}$
`\AngAccl{frame-1}{frame-2}`	`\AngAccl{O}{B}`	${}^{\bar{O}}\vec{\alpha}^{\bar{B}}$
`\AngVel{frame-1}{frame-2}`	`\AngVel{O}{B}`	${}^{\bar{O}}\vec{\omega}^{\bar{B}}$
`\Cross{vector-1}{vector-2}`	`\Cross{A}{B}`	$A \times B$
`\CrossProd{frame}{a_1}{a_2}{a_3}{b_1}{b_2}{b_3}`		$\begin{vmatrix} \vec{i}_{\bar{O}} & \vec{j}_{\bar{O}} & \vec{k}_{\bar{O}} \\ a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \end{vmatrix}$
`\Deriv[order]{with-respect-to-variable}`	`\Deriv[]{x}`	$\dfrac{d}{dx}$

Function Syntax	**Example**	**Output**
	`\Deriv[3]{t}`	$\frac{d^3}{dt^3}$
`\DirectCosMat`	`\DirectCosMat`	$\begin{bmatrix} C_{11} & C_{12} & C_{13} \\ C_{21} & C_{22} & C_{23} \\ C_{31} & C_{32} & C_{33} \end{bmatrix}$
`\Fext`	`\Fext`	$\sum \vec{F}_{ext}$
`\Frame{vector}{frame}`	`\Frame{A}{B}`	$\{A\}_{\bar{B}}$
`\FrameDef{point}{frame}`	`\FrameDef{Q}{O}`	$\{Q, \vec{i}_{\bar{O}}, \vec{j}_{\bar{O}}, \vec{k}_{\bar{O}}\}$
`\Inert{point}`	`\Inert{A}`	$\tilde{I}_A$
`\InertF{point}{frame}`	`\InertF{A}{B}`	$[\tilde{I}_A]_{\bar{B}}$
`\InertMat`	`\InertMat`	$\begin{bmatrix} I_{xx} & I_{xy} & I_{xz} \\ I_{xy} & I_{yy} & I_{yz} \\ I_{xz} & I_{yz} & I_{zz} \end{bmatrix}$
`\Lagr`	`\Lagr`	$\mathcal{L}$

Function Syntax	**Example**	**Output**
`\OmegaMat`	`\OmegaMat`	$\begin{bmatrix} 0 & -\omega_x & -\omega_y & -\omega_z \\ \omega_x & 0 & \omega_z & -\omega_y \\ \omega_y & -\omega_z & 0 & \omega_x \\ \omega_z & \omega_y & -\omega_x & 0 \end{bmatrix}$
`\Partl[order]{with-respect-to-variable}`	`\Partl[]{x}`	$\frac{\partial}{\partial x}$
	`\Partl[3]{t}`	$\frac{\partial^3}{\partial t^3}$
`\PosVec{point}{with-respect-to-point}`	`\PosVec{A}{Q}`	$\vec{r}_{A/Q}$
`\QuatAngle`	`\QuatAngle`	$\begin{aligned} q_0 &= cos(\frac{\phi}{2}) \\ q_1 &= a_x sin(\frac{\phi}{2}) \\ q_2 &= a_y sin(\frac{\phi}{2}) \\ q_3 &= a_z sin(\frac{\phi}{2}) \end{aligned}$
`\QuatBCO`	`\QuatBCO`	$\begin{bmatrix} q_0^2+q_1^2-q_2^2-q_3^2 & 2(q_1q_2+q_0q_3) & 2(q_1q_3-q_0q_2) \\ 2(q_1q_2-q_0q_3) & q_0^2-q_1^2+q_2^2-q_3^2 & 2(q_2q_3+q_0q_1) \\ 2(q_1q_3+q_0q_2) & 2(q_2q_3-q_0q_1) & q_0-q_1^2-q_2^2+q_3^2 \end{bmatrix}$
`\QuatDef{frame}`	`\QuatDef{B}`	$q_0 + q_1\vec{i}_{\bar{B}} + q_2\vec{j}_{\bar{B}} + q_3\vec{k}_{\bar{B}}$

Function Syntax	Example	Output
`\QuatDot`	`\QuatDot`	$\begin{Bmatrix} \dot{q}_0 \\ \dot{q}_1 \\ \dot{q}_2 \\ \dot{q}_3 \end{Bmatrix} = \frac{1}{2} \begin{bmatrix} 0 & -\omega_x & -\omega_y & -\omega_z \\ \omega_x & 0 & \omega_z & -\omega_y \\ \omega_y & -\omega_z & 0 & \omega_x \\ \omega_z & \omega_y & -\omega_x & 0 \end{bmatrix} \begin{Bmatrix} q_0 \\ q_1 \\ q_2 \\ q_3 \end{Bmatrix}$
`\QuatMat`	`\QuatMat`	$\begin{bmatrix} -q_1 & q_0 & q_3 & -q_2 \\ -q_2 & -q_3 & q_0 & q_1 \\ -q_3 & q_2 & -q_1 & q_0 \\ q_0 & q_1 & q_2 & q_3 \end{bmatrix}$
`\Rfrac{numerator}{denominator}`	`\Rfrac{A}{B}`	${}^{A}\!/_{B}$
`\Rotate{angle}{axis}`	`\Rotate{\phi}{X}`	$[R\phi]_X$
`\RotateMat{frame-1}{frame-2}`	`\RotateMat{B}{O}`	${}^{\bar{B}}[C]^{\bar{O}}$
`\RotateMatDot{frame-1}{frame-2}`	`\RotateMatDot{B}{O}`	${}^{\bar{B}}[\dot{C}]^{\bar{O}}$
`\RotateMatX{angle}`	`\RotateMatX{\theta}`	$\begin{bmatrix} 1 & 0 & 0 \\ 0 & cos(\theta) & sin(\theta) \\ 0 & -sin(\theta) & cos(\theta) \end{bmatrix}$

Function Syntax	Example	Output
`\RotateMatY{angle}`	`\RotateMatY{\phi}`	$\begin{bmatrix} cos(\phi) & 0 & -sin(\phi) \\ 0 & 1 & 0 \\ sin(\phi) & 0 & cos(\phi) \end{bmatrix}$
`\RotateMatZ{angle}`	`\RotateMatZ{\psi}`	$\begin{bmatrix} cos(\psi) & sin(\psi) & 0 \\ -sin(\psi) & cos(\psi) & 0 \\ 0 & 0 & 1 \end{bmatrix}$
`\Text[point]`	`\Text`	$\sum \vec{\tau}$
	`\Text[P]`	$\sum \vec{\tau}_P$
`\TransOne{frame-1}{frame-2}{vector}`	`\TransOne{O}{B}{A}`	$^{\bar{O}}\dfrac{d}{dt}A = {}^{\bar{B}}\dfrac{d}{dt}A + {}^{\bar{O}}\vec{\omega}^{\bar{B}} \times A$
`\TransTwo{frame-1}{frame-2}{vector}`	`\TransTwo{O}{B}{A}`	$^{\bar{O}}\dfrac{d^2}{dt^2}A = {}^{\bar{B}}\dfrac{d^2}{dt^2}A + 2{}^{\bar{O}}\vec{\omega}^{\bar{B}} \times {}^{\bar{B}}\dfrac{d}{dt}A + {}^{\bar{O}}\vec{\alpha}^{\bar{B}} \times A + {}^{\bar{O}}\vec{\omega}^{\bar{B}} \times \left({}^{\bar{O}}\vec{\omega}^{\bar{B}} \times A\right)$
`\UnitDyad{unit-vector}{unit-vector}{frame}`	`\UnitDyad{i}{k}{B}`	$\vec{i}_{\bar{B}}\vec{k}_{\bar{B}}$
`\UnitVec{vector}{frame}`	`\UnitVec{i}{O}`	$\vec{i}_{\bar{O}}$
`\UpRight{frame}{quantity}`	`\UpRight{O}{A}`	$^{\bar{O}}A$

Function Syntax	**Example**	**Output**
`\VecExpressH{frame}{element-1}{element-2}{element-3}`	`\VecExpressH{D}{a}{b}{c}`	$\{a\vec{i}_{\bar{D}} + b\vec{j}_{\bar{D}} + c\vec{k}_{\bar{D}}\}$
`\VecExpressV{element-1}{element-2}{element-3}`	`\VecExpressV{a}{b}{c}`	$\begin{Bmatrix} a \\ b \\ c \end{Bmatrix}$
`\VecExpressVF{element-1}{element-2}{element-3}{element-4}`	`\VecExpressVF{a}{b}{c}{d}`	$\begin{Bmatrix} a \\ b \\ c \\ d \end{Bmatrix}$
`\VelVec{derivative-frame}{point}{with-respect-to-point}`	`\VelVec{O}{A}{Q}`	${}^{\bar{O}}\vec{v}_{A/Q}$
`\wX{frame-1}{frame-2}`	`\wX{B}{O}`	$\{0,0,1\} *^{\bar{B}} [C]^{\bar{O}} *^{\bar{O}} [\dot{C}]^{\bar{B}} * \begin{Bmatrix} 0 \\ 1 \\ 0 \end{Bmatrix}$
`\wY{frame-1}{frame-2}`	`\wY{B}{O}`	$\{1,0,0\} *^{\bar{B}} [C]^{\bar{O}} *^{\bar{O}} [\dot{C}]^{\bar{B}} * \begin{Bmatrix} 0 \\ 0 \\ 1 \end{Bmatrix}$

Function Syntax	Example	Output
`\wZ{frame-1}{frame-2}`	`\wZ{B}{O}`	$\{0,1,0\} *^{\bar{B}} [C]^{\bar{O}} *^{\bar{O}} [\dot{C}]^{\bar{B}} * \begin{Bmatrix} 1 \\ 0 \\ 0 \end{Bmatrix}$

Below is a list with useful functions which are generally available when using Latex.

Function Syntax	Package	Example	Output
`\bar{frame}`	amsmath	`\bar{A}`	$\bar{A}$
`\cdot`	amsmath	`A\cdot{B}`	$A \cdot B$
`\dot{element}`	amsmath	`\dot{x}`	$\dot{x}$
`\ddot{element}`	amsmath	`\ddot{x}`	$\ddot{x}$
`\sum`		`\sum`	$\sum$
`\vec{vector}`	amsmath	`\vec{A}`	$\vec{A}$