Vector notation • Cartesian coordinates - $\mathbf{A} = A_x(x,y,z)\mathbf{i} + A_y(x,y,z)\mathbf{j} + A_z(x,y,z)\mathbf{k}$ • Cylindrical polar coordinates - $\mathbf{A} = A_r(r,\varphi,z)\hat{\mathbf{r}} + A_\varphi(r,\varphi,z)\boldsymbol{\phi} + A_z(r,\varphi,z)\mathbf{k}$ • Spherical polar coordinates - $\mathbf{A} = A_r(r,\theta,\varphi)\hat{\mathbf{r}} + A_\theta(r,\theta,\varphi)\boldsymbol{\theta} + A_\varphi(r,\theta,\varphi)\boldsymbol{\phi}$	Using Maple A:=vector([a,b,c]);

Dot Products
 	
• Cartesian coordinates - $\mathbf{A}.\mathbf{B} = A_x B_x + A_y B_y + A_z B_z$
• Cylindrical polar coordinates - $\mathbf{A}.\mathbf{B} = A_r B_r + A_\varphi B_\varphi + A_z B_z$
• Spherical polar coordinates - $\mathbf{A}.\mathbf{B} = A_r B_r + A_\theta B_\theta + A_\varphi B_\varphi$
	Using Maple
	
	dotprod(a, b);
	dotprod(a, b, 'orthogonal');

Cross Products • Cartesian coordinates - **A** x **B** = • Cylindrical polar coordinates - **A** x **B** = • Spherical polar coordinates - **A** x **B** =	Using Maple crossprod(v1,v2);

Divergence
 	
• Cartesian coordinates - $\nabla.\mathbf{A}$ =
• Cylindrical polar coordinates - **A** x **B** =
• Spherical polar coordinates - **A** x **B** =
	Using Maple
	
	diverge(f, v);
	diverge(h, v, coords=cylindrical);
	diverge(i, v, coords=spherical);
	where v is the basis vector

Gradient	Using Maple
	
	grad(f, v);
	grad(h, v, coords=cylindrical);
	grad(i, v, coords=spherical);
	where v is the basis vector

Curl	Using Maple
	
	curl(f, v);
	curl(h, v, coords=cylindrical);
	curl(i, v, coords=spherical);
	where v is the basis vector

Vectors and Maple

Vector notation

- Cartesian coordinates - $\mathbf{A} = A_x(x,y,z)\mathbf{i} + A_y(x,y,z)\mathbf{j} + A_z(x,y,z)\mathbf{k}$
- Cylindrical polar coordinates - $\mathbf{A} = A_r(r,\varphi,z)\hat{\mathbf{r}} + A_\varphi(r,\varphi,z)\boldsymbol{\hat\varphi} + A_z(r,\varphi,z)\mathbf{k}$
- Spherical polar coordinates - $\mathbf{A} = A_r(r,\theta,\varphi)\hat{\mathbf{r}} + A_\theta(r,\theta,\varphi)\boldsymbol{\hat\theta} + A_\varphi(r,\theta,\varphi)\boldsymbol{\hat\varphi}$

Maple notation

Vector definition	A:=vector([a,b,c]);
Dot Products	dotprod(a, b);
Cross Products	crossprod(v1,v2);

Divergence	diverge(f, v);
	diverge(h, v, coords=cylindrical);
	diverge(i, v, coords=spherical);
	where v is the basis vector

Gradient	grad(f, v);
	grad(h, v, coords=cylindrical);
	grad(i, v, coords=spherical);
	where v is the basis vector

Curl	curl(f, v);
	curl(h, v, coords=cylindrical);
	curl(i, v, coords=spherical);
	where v is the basis vector