

Equations of Lines and Planes

Plane Plots

```
>
```

```
> restart:
```

```
> with(VectorCalculus):
```

```
Warning, the assigned names <,> and <|> now have a global binding
```

```
Warning, these protected names have been redefined and unprotected: *, +, -, ., D, Vector, diff, int, limit, series
```

```
> with(geom3d):
```

```
Warning, the name TangentPlane has been rebound
```

```
Warning, the assigned name polar now has a global binding
```

Define points A, B, and C

```
> point(A,2,1,1); point(B,0,4,1); point(C,-2,1,4);
```

A

B

C

Parametric equations of the line l passing through A and B,

$$[x, y, z] = [x_1 + at, y_1 + bt, z_1 + ct]$$

```
> line(l, [A, B]);
```

l

```
> Equation(l, 't');
```

$$[2 - 2t, 1 + 3t, 1]$$

Parametric equations of the line m passing through A and parallel to vector v ,

$$[x, y, z] = [x_1 + at, y_1 + bt, z_1 + ct]$$

```
> v := [-3, 2, 5];
```

$$v := [-3, 2, 5]$$

```
> line(m, [A, v]);
```

m

```
> Equation(m, 't');
```

$$[2 - 3t, 1 + 2t, 1 + 5t]$$

Parametric equations of the line n passing through A and perpendicular to the plane p ,

$$[x, y, z] = [x_1 + at, y_1 + bt, z_1 + ct]$$

```
> plane(p, 3*x+2*y-z=6, [x, y, z]);
```

p

```
> line(n, [A, p]);
```

n

```
> Equation(n, 't');
```

$$[2 + 3t, 1 + 2t, 1 - t]$$

Equation of a plane passing through three points A, B, and C

```
> plane(p1,[A,B,C],[x,y,z]);
```

p1

```
> Equation(p1);
```

$$-36 + 9x + 6y + 12z = 0$$

Equation of a plane passing through point A and perpendicular to vector n

```
> n:=[2,3,1];
```

n := [2, 3, 1]

```
> plane(p2,[A,n],[x,y,z]);
```

p2

```
> Equation(p2);
```

$$-8 + 2x + 3y + z = 0$$

Planes Plots

```
> restart;
```

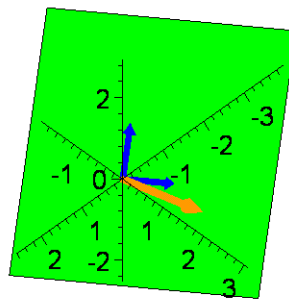
```
> with(Student[LinearAlgebra]):
```

Warning, the protected name . has been redefined and unprotected

```
> infolevel[Student[LinearAlgebra]]:
```

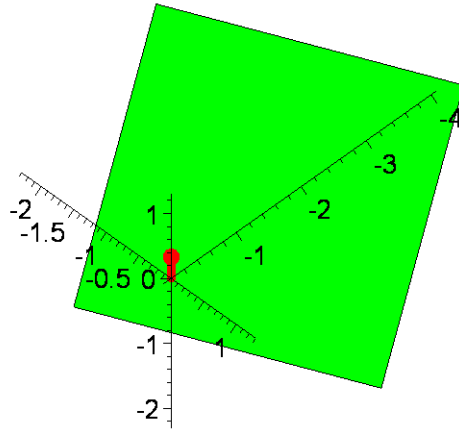
```
> PlanePlot( <1,3,2>, showbasis );
```

A Plane



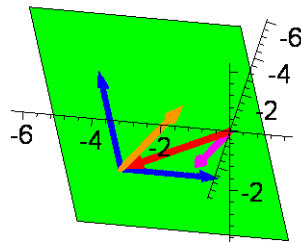
```
> PlanePlot( x+y+z = -3, [x,y,z], normaloptions=[shape=harpoon] );
```

A Plane



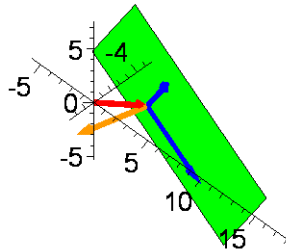
```
> PlanePlot(<1,2,3>,<1,-3,-1>, orientation=[10,58],  
shownearestpoint,  
showbasis );
```

A Plane



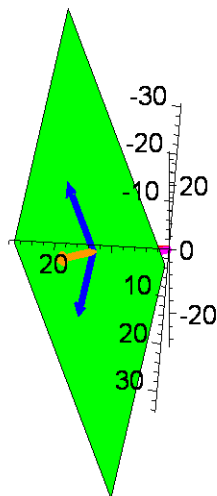
```
> PlanePlot({<1,3,5.>,<2,7,-1>},<-3,2,-1>);
```

A Plane



```
> PlanePlot((s,t)->s*<1,3,-5>+t*<.01,-.02,.01>+<13,2,1>, showbasis,  
shownearestpoint);
```

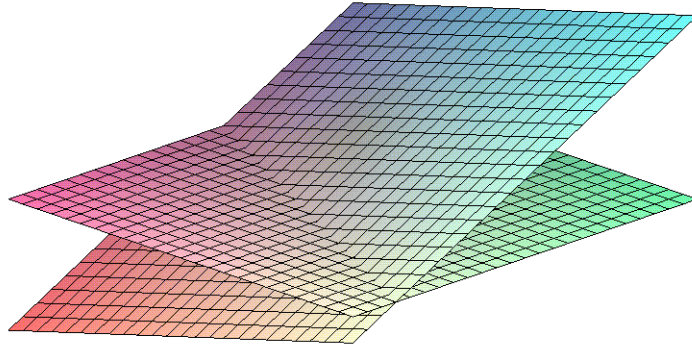
A Plane



```
> p1:=plot3d(-x+2*y+2,x=-2..2,y=-2..2):
```

```
p2:=plot3d(x+y+1,x=-2..2,y=-2..2):
```

```
> display(p1,p2);
```



```
[ >  
[ >  
[ >
```