```
> restart:with(plots):
  with(Student[Precalculus]):with(student):with(linalg):Digits := 4:
Warning, the name changecoords has been redefined

Warning, the protected names norm and trace have been redefined and unprotected
```

What do you know , Calculus 2673, 9/6/2006

```
> P1:=[1,1,1];P2:= [3,3,0]; # created vectors P2 and P1 with
  bracktes { .. ]
```

$$P1 := [1, 1, 1]$$

$$P2 := [3, 3, 0]$$

I .) find distance beteen P1 and P2. create vector from P1 to P2 tehn find its length

```
> Vec := (P2-P1);norm(Vec,2);
```

$$Vec := [2, 2, -1]$$

$$3$$

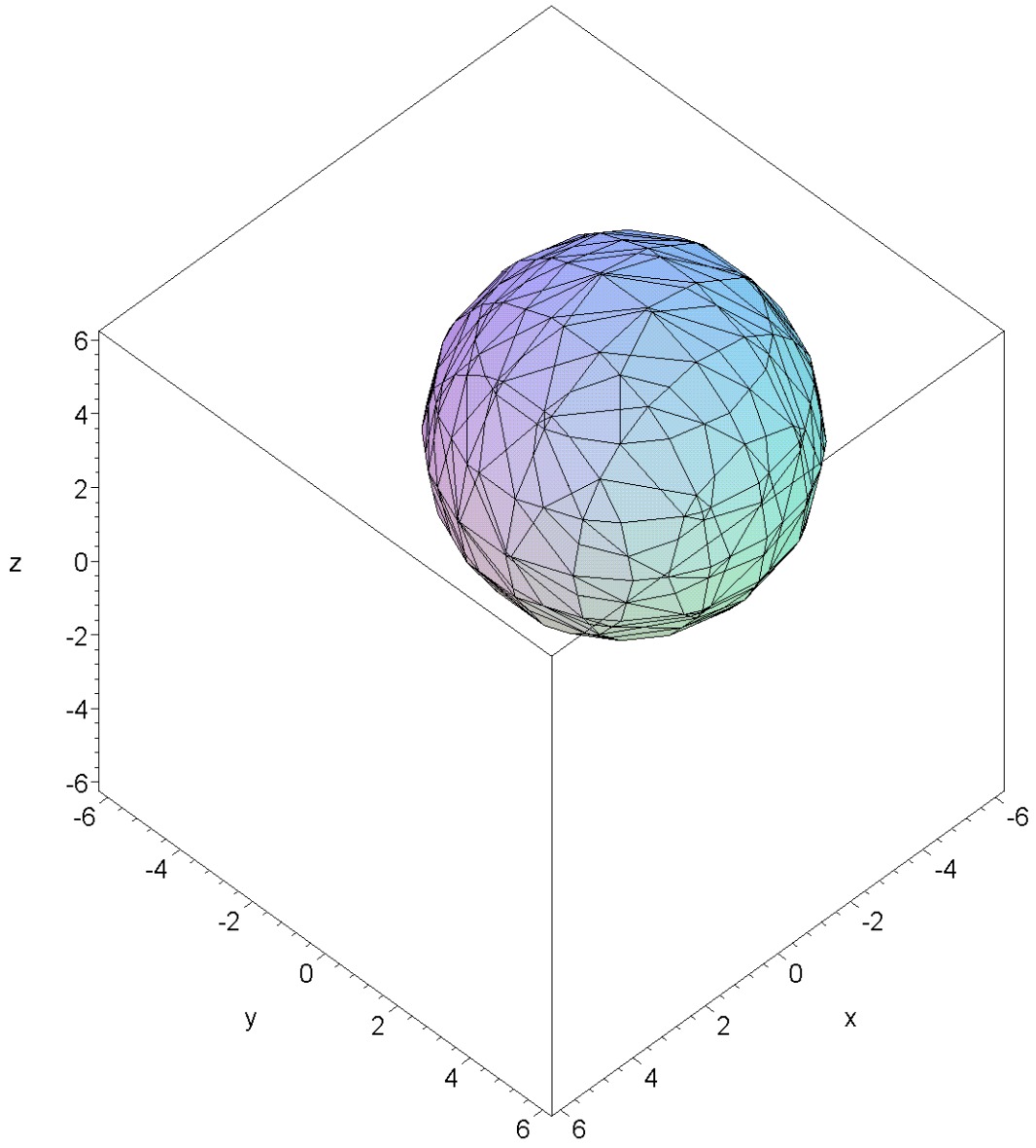
II.) spheres; center radius gaphi

```
>
>
```

```
> CompleteSquare(x^2+y^2+z^2 + 4*x -4*z = 0, x, z);
```

$$(z-2)^2 + (x+2)^2 + y^2 - 8 = 0$$

```
> implicitplot3d(x^2 +y^2 + z^2 +4*x-4*z= 8,x=-6..6,y=-6..6, z= -6
  .. 6, axes= boxed);
```



III Finding vectors and length P.860 ex 17

```
> P1:=[5,7,-1];P2:=[2,9,-2]; # then compute P2-P1
```

$$P1 := [5, 7, -1]$$

$$P2 := [2, 9, -2]$$

```
> v:= P2 - P1;
```

$$v := [-3, 2, -1]$$

IV Finding projections P.870 ex 3

```
> v:= [ 10,11,-2]; u:=[3,4,0];
```

$$v := [10, 11, -2]$$

$$u := [3, 4, 0]$$

now find the proj of u onto v

```
> proj:= dotprod(u,v)*v/(norm(v,2)^2);
```

$$proj := \left[\frac{148}{45}, \frac{814}{225}, \frac{-148}{225}\right]$$

```
> perp:= u - proj;
```

$$perp := \left[\frac{-13}{45}, \frac{86}{225}, \frac{148}{225}\right]$$

```
>
```

V P. 879 ex 15 . Find the equation of the plane .

```
> P:=[1,-1,2];Q:=[2,0,-1]; R:=[0,2,1];#  points in the  plane
```

$$P := [1, -1, 2]$$

$$Q := [2, 0, -1]$$

$$R := [0, 2, 1]$$

```
> PQ := Q-P; RQ:= R-Q;  N:=crossprod(PQ,RQ); # normal of 2 vectors
  in the plane
```

$$PQ := [1, 1, -3]$$

$$RQ := [-2, 2, 2]$$

$$N := [8, 4, 4]$$

```
> R:=vector([x,y,z]);
```

$$R := [x, y, z]$$

```
> u:=dotprod(R,N);k :=(dotprod(N,P)); # direction and konstant
```

$$u := 8\,x + 4\,y + 4\,z$$

$$k := 12$$

```
> u = k; # equation of the  plane
```

$$8\,x + 4\,y + 4\,z = 12$$

VI p.888 ex 21

```
> Po:=[0,2,-1]; N:= [3,-2,-1];
```

$$Po := [0, 2, -1]$$

$$N := [3, -2, -1]$$

```
> u:=dotprod(R,N);k :=(dotprod(N,P)); # direction and konstant
> u = k; # equation of the  plane
>
```

$$u := 3\,x - 2\,y - z$$

$$k := 3$$

$$3x - 2y - z = 3$$

>