

MATHEMATICS 201-105-RE

Linear Algebra

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Winter 2006

Assignment #3

Solutions

```
> with(linalg):with(plottools):with(plots):
```

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

```
Warning, the name changecoords has been redefined
```

```
Warning, the previous binding of the name arrow has been removed and it now  
has an assigned value
```

Question 3

```
> A:=[3,2,1];  
   B:=[-2,4,-6];  
   C:=[4,0,-5];
```

```
A := [3, 2, 1]
```

```
B := [-2, 4, -6]
```

```
C := [4, 0, -5]
```

(a)

```
> AB:=B-A;
```

```
AB := [-5, 2, -7]
```

```
> l:=A+t*AB;
```

```
l := [3, 2, 1] + t[-5, 2, -7]
```

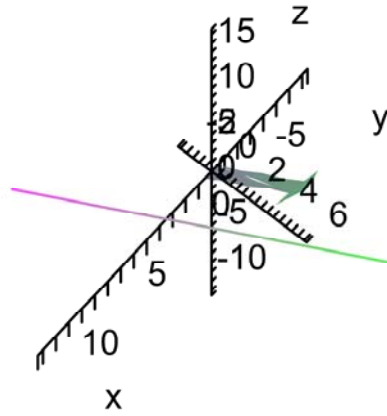
(b)

```
> zero:=[0,0,0]:
```

```
gu:=arrow(zero,AB,1,3,0.1):
```

```
gline:=spacecurve(evalm(l),t=-2..2):
```

```
display(gline,gu, axes=normal, labels=[x,y,z],scaling=constrained);
```



(c)

> distance := norm(crossprod(C-A, B-A), 2) / norm(B-A, 2) ;

$$distance := \frac{1}{78} \sqrt{2109} \sqrt{78}$$

>

Question 6

> A := [-1, 3, 4] ;

B := [3, 3, 0] ;

C := [2, -1, 3] ;

E := [1, 3, 1] ;

A := [-1, 3, 4]

B := [3, 3, 0]

C := [2, -1, 3]

E := [1, 3, 1]

(a)

```
> n:=crossprod(B-A,C-A);
```

$$n := [-16, -8, -16]$$

```
> pi:=dotprod([x,y,z],n)=dotprod(n,A);
```

$$\pi := -16x - 8y - 16z = -72$$

(b)

```
> l:=E+t*evalm(n);
```

$$l := [1, 3, 1] + t[-16, -8, -16]$$

(c)

```
> distance:=abs(dotprod(E-A,crossprod(B-A,C-A)))/norm(crossprod(B-A,C-A),2)
```

$$distance := \frac{2}{3}$$

(d)

```
> zero:=[0,0,0]:
```

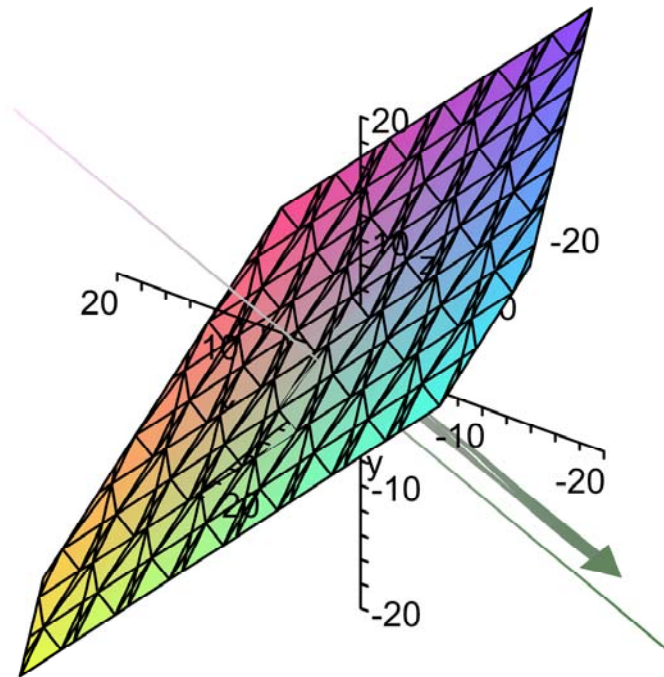
```
gn:=arrow(zero,n,1,3,0.1):
```

```
gline:=spacecurve(evalm(l),t=-2..2):
```

```
gplane:=implicitplot3d(pi,x=-20..20,y=-20..20,z=-20..20):
```

```
display(gplane,gline,gn, axes=normal,
```

```
labels=[x,y,z],scaling=constrained,view=[-20..20,-20..20,-20..20]);
```



(e)

```
> Volume := abs ( dotprod ( B-A, crossprod ( C-A, E-A ) ) ) / 6;
```

$$Volume := \frac{8}{3}$$

```
>
```