

MATH 253 Spring 2004 Section 505 P. Yasskin

Maple Quiz Solutions

```
> restart:with(VecCalc):VCalias:
```

```
#1
```

```
> x1:=r*cos(theta);
```

$$x1 := r \cos(\theta)$$

```
> y1:=r*sin(theta);
```

$$y1 := r \sin(\theta)$$

```
> z1:=z;
```

$$z1 := z$$

```
> rho:=2+x1+y1+z1;
```

$$\rho := 2 + r \cos(\theta) + r \sin(\theta) + z$$

```
> M:=Muint(rho*r, r=0..2, theta=0..2*Pi, z=0..3); M:=value(%);
```

$$M := \int_0^3 \int_0^{2\pi} \int_0^2 (2 + r \cos(\theta) + r \sin(\theta) + z) r \, dr \, d\theta \, dz$$

$$M := 42 \pi$$

```
> xmom:=Muint(x1*rho*r, r=0..2, theta=0..2*Pi, z=0..3);  
xmom:=value(%);
```

$$xmom := \int_0^3 \int_0^{2\pi} \int_0^2 r^2 \cos(\theta) (2 + r \cos(\theta) + r \sin(\theta) + z) \, dr \, d\theta \, dz$$

$$xmom := 12 \pi$$

```
> xbar:=xmom/M; xbar:=evalf(%);
```

$$xbar := \frac{2}{7}$$

$$xbar := 0.2857142857$$

```
> ymom:=Muint(y1*rho*r, r=0..2, theta=0..2*Pi, z=0..3);  
ymom:=value(%);
```

$$ymom := \int_0^3 \int_0^{2\pi} \int_0^2 r^2 \sin(\theta) (2 + r \cos(\theta) + r \sin(\theta) + z) \, dr \, d\theta \, dz$$

$$ymom := 12 \pi$$

```
> ybar:=ymom/M; ybar:=evalf(%);
```

$$ybar := \frac{2}{7}$$

$$ybar := 0.2857142857$$

```
> zmom:=Muint(z1*rho*r, r=0..2, theta=0..2*Pi, z=0..3);  
zmom:=value(%);
```

$$z_{mom} := \int_0^3 \int_0^{2\pi} \int_0^2 z (2 + r \cos(\theta) + r \sin(\theta) + z) r dr d\theta dz$$

$$y_{mom} := 72 \pi$$

> **zbar:=zmom/M; zbar:=evalf(%);**

$$zbar := \frac{1}{42} \left(\frac{1}{\pi} \int_0^3 \int_0^{2\pi} \int_0^2 z (2 + r \cos(\theta) + r \sin(\theta) + z) r dr d\theta dz \right)$$

$$zbar := 1.714285714$$

> **cm:=[xbar,ybar,zbar];**

$$cm := [0.2857142857, 0.2857142857, 1.714285714]$$

> **cmc:=r2c(cm);**

$$cmc := [0.4040610178, 0.7853981634, 1.714285714]$$

> **r2d(cmc[2]);**

$$44.99999998$$

#2

> **f:=[x,y,z] &-> (x*y^2*z^3);**

$$f := (x, y, z) \rightarrow x y^2 z^3$$

> **delf:=Grad(f);**

$$delf := [(x, y, z) \rightarrow y^2 z^3, (x, y, z) \rightarrow 2 x y z^3, (x, y, z) \rightarrow 3 x y^2 z^2]$$

> **P:=[3,2,1];**

$$P := [3, 2, 1]$$

> **N:=delf &@ P;**

$$N := [4, 12, 36]$$

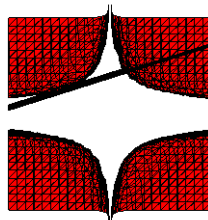
> **X:=[x,y,z];**

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

> **tanpl:=N &. X = N &. P;**

$$tanpl := 4 x + 12 y + 36 z = 72$$

> **implicitplot3d([f(x,y,z)=12,tanpl], x=-5..5, y=-5..5, z=-5..5, color=[red,blue], grid=[25,25,25]);**



>