MATH 253 Fall 2003 Section 505 P. Yasskin
Maple Quiz Solutions

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

#1

```
> x0:=rho*sin(phi)*cos(theta);
```

$$x0 := \rho \sin(\phi) \cos(\theta)$$

```
> y0:=rho*sin(phi)*sin(theta);
```

$$y0 := \rho \sin(\phi) \sin(\theta)$$

```
> z0:=rho*cos(phi);
```

$$z0 := \rho \cos(\phi)$$

```
> J:=rho^2*sin(phi);
```

$$J := \rho^2 \sin(\phi)$$

```
> delta:=x0^2+y0^2; delta:=simplify(%);
```

$$\delta := \rho^2 \sin(\phi)^2 \cos(\theta)^2 + \rho^2 \sin(\phi)^2 \sin(\theta)^2$$

$$\delta := -\rho^2 (-1 + \cos(\phi)^2)$$

```
> M:=Muint(delta*J, rho=0..sin(phi), phi=0..Pi, theta=0..2*Pi);
  M:=value(%);
```

$$M := \int_0^{2\pi} \int_0^{\pi} \int_0^{\sin(\phi)} -\rho^4 (-1 + \cos(\phi)^2) \sin(\phi) \, d\rho \, d\phi \, d\theta$$

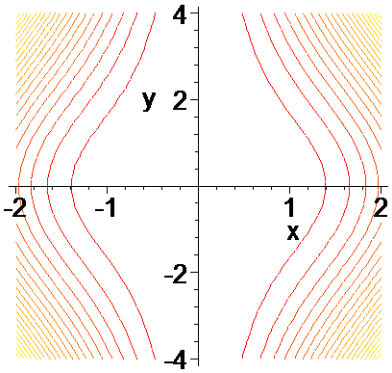
$$M := \frac{7 \pi^2}{64}$$

#2

```
> f:=MF(<x,y>,x^4+x^2*y^2);
```

$$f := (x, y) \to x^4 + x^2 y^2$$

```
> cp:=contourplot(f(x,y), x=-2..2, y=-4..4, contours=20): cp;
```




```
> P:=<1|2>;
```

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

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

$$delf := [(x, y) \to 4 x^3 + 2 x y^2, (x, y) \to 2 x^2 y]$$

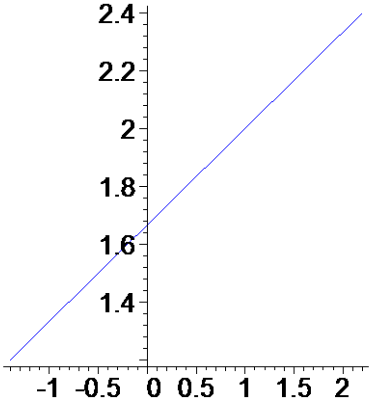
```
> v:=delf &@ P;
```

$$v := [12, 4]$$

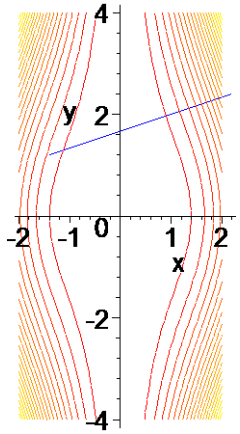
```
> X:=P+t*v;
```

$$X := [1 + 12\,t, 2 + 4\,t]$$

```
> pline:=plot([X[1],X[2], t=-.2..0.1], color=blue): pline;
```




```
> display(cp,pline, axes=normal, scaling=constrained);
```




```
>
```