Maple Homework 3 Spring 2008

Due Date: Tuesday, May 6th

Partial derivatives

- Compute the second partial derivatives of $f(x, y) = x^3 + x^2y^3 - 2y^2$

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dfdx:=diff(f,x);
dfdy:=diff(f,y);
dfdx2:=diff(f,x,x);
dfdy2:=diff(f,y,y);
dfdxy:=diff(f,x,y);
dfdyx:=diff(f,y,x);
```

- Compute f_{xxyz} if $f(x, y, z) = \sin(3x + yz)$

- Check that each of the following functions is a solution of the wave function $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$

  (a) $u = \sin(kx)\sin(ckt)$
  (b) $u = t/(c^2t^2 - x^2)$
  (c) $u = (x - ct)^6 + (x + ct)^6$
  (d) $u = \sin(x - ct) + \ln(x + ct)$

Method of Lagrange multipliers

- Find the extreme values of $f(x, y) = x^2+2y^2$ on the circle $g(x, y) = x^2+y^2 = 1$
  In other words, solve the system $\nabla f = \lambda \nabla g$, $g = 1$ for (x, y, λ).

```
sol:=solve({diff(f,x)=L*diff(g,x), diff(f,y)=L*diff(g,y), g=1}, {x,y,L});
subs(sol[1],f);
subs(sol[2],f);
subs(sol[3], f);
subs(sol[4],f);
```

- A rectangular box without a lid is to be made from 12 cm^2 of cardboard. Find the maximum volume of such a box. In other words, find the maximum of $f(x, y, z) = xyz$ (volume) subject to $g(x, y, z) = 2xz+2yz+xy = 12$ (surface)

- Find the extreme values of $f(x, y, z) = 2x + 6y + 10z$ subject to $g(x, y, z) = x^2 + y^2 + z^2 = 35$

Double integrals

- Compute the integral

$$\int_{-3}^{3}\int_{0}^{1}\frac{xy^2}{x^2+1}\,dxdy$$

- Compute the integral

$$\int_{0}^{\pi}\int_{1}^{2} y\sin(xy)\,dxdy$$

- Compute the integral

$$\int_{0}^{\ln 2}\int_{0}^{\ln 5} e^{2x-y}\,dxdy$$

- Compute the integral

$$\int_{0}^{1}\int_{0}^{1}\frac{x}{1+xy}\,dxdy$$

- Compute the integral

$$\int_{0}^{1}\int_{1}^{2}\frac{x}{x^2+y^2}\,dxdy$$

- Compute the integral

$$\int_{0}^{1}\int_{0}^{y}\sin y^2\,dxdy$$