MAT 226

Solutions to HW 4

$$f(x,y,z) = e^{\sqrt{x^2+y^2}} + 3xyz\cos(x^2 z)$$

a) $$\frac{\partial f}{\partial x} = e^{\sqrt{x^2+y^2}} \frac{1}{2\sqrt{x^2+y^2}} \cdot 2x + 3yz\cos(x^2 z)$$
$$+ 3xyz\left(-\sin(x^2 z)\right) 2xz$$
$$= \frac{x e^{\sqrt{x^2+y^2}}}{\sqrt{x^2+y^2}} + 3yz\cos(x^2 z) - 6x^2 y z^2 \sin(x^2 z).$$

b) $$\frac{\partial f}{\partial y} = e^{\sqrt{x^2+y^2}} \frac{y}{\sqrt{x^2+y^2}} + 3xz\cos(x^2 z)$$

c) $$\frac{\partial f}{\partial z} = 3xy\cos(x^2 z) + 3xyz\left(-\sin(x^2 z)\right) . x^2$$
$$= 3xy\cos(x^2 z) - 3x^3 yz\sin(x^2 z).$$

d) $$\frac{\partial^2 f}{\partial x\,\partial z} = \frac{\partial}{\partial x}\left(\frac{\partial f}{\partial z}\right) = 3y\cos(x^2 z) + 3xy\left(-\sin(x^2 z)\right) 2xz$$
$$- 9x^2 yz\sin(x^2 z) - 3x^3 yz\cos(x^2 z)\, 2xz$$

e) $\dfrac{\partial^2 f}{\partial y \, \partial z} = \dfrac{\partial}{\partial y}\left(\dfrac{\partial f}{\partial z}\right) = 3x \cos(x^2 z) - 3x^3 z \sin(x^2 z)$