7. If $f(x,y) = e^{xy}$, find the partial derivatives f_x, f_y, f_{xx}, f_{xy}, f_{yx}, and f_{yy}.

8. Find $\dfrac{\partial}{\partial x}\dfrac{\sin(xy)}{\cos(x+y)}$.

9. If $z = f(x,y)$ where $x = uv$ and $y = 2u+3v$, find $\dfrac{\partial z}{\partial v}$ in terms of the partial derivatives of f and the variables u and v.

10. Show $f(x,y) = \log\sqrt{x^2+y^2}$ satisfies the equation $f_{xx} + f_{yy} = 0$.

11. Find the equation of the plane tangent to the surface given by $z = 5+(x-1)^2+(y+2)^2$ at the point $(2,0,10)$.

12. Compute the gradient, ∇f, of the function

$$f(x,y,z) = \sqrt{(x-a)^2+(y-b)^2+(z-c)^2}.$$

Show that the result is a unit vector (that is, it has length one). Which way is it pointing?

13. Compute the gradient, ∇f, of the function $f(x,y) = (x^2+y^2)^{-1/2}$, and show that $\nabla f(\vec{x})$ points toward the origin and has length equal to $1/(\vec{x}\cdot\vec{x})$

14. Let $f(x,y,z) = x^2 + ye^z$.

    (a) Compute the gradient of f.

    (b) Find the derivative of f at $(1,0,0)$ in the direction $\vec{u} = \frac{1}{\sqrt{2}}(\vec{i}+\vec{k})$.

    (c) In what direction is f increasing most rapidly at $(1,0,0)$.