MATH 232 NAME:
14.6

Partial solutions for 7 8 11 12 13 21 22

7. $\nabla f(x,y) = \frac{1}{y}\mathbf{i} - \frac{x}{y^2}\mathbf{j}$, $\nabla f(2,1) = \mathbf{i} - 2\mathbf{j}$, $D_{\mathbf{u}} f(2,1) = -1$

8. $\nabla f(x,y) = 2x \ln y \mathbf{i} + (x^2/y)\mathbf{j}$, $\nabla f(3,1) = 9\mathbf{j}$, $D_{\mathbf{u}} f(3,1) = 108/3$

11. $\nabla f(x,y) = \langle e^x \sin(y), e^x \cos(y)\rangle$, $\nabla f(0,\pi/3) = \langle \frac{3}{2}, \frac{1}{2}\rangle$. Unit vector in direction of $\mathbf{v}$ is $\frac{4-3\sqrt{3}}{10}$

12. $\langle \frac{y^2-x^2}{(x^2+y^2)^2}, \frac{-2xy}{(x^2+y^2)^2}\rangle$, $\nabla f(1,2) = \langle 3/25, -4/25\rangle$, $D_u f(1,2) = -\frac{11}{25\sqrt{34}}$

13. $\nabla g(2,4) = 2\mathbf{i} + \frac{1}{2}\mathbf{j}$, $D_u g(2,4) = \frac{7}{2\sqrt{5}}$

21. $\nabla f(x,y) = \langle \frac{2y}{\sqrt{x}}, 4\sqrt{x}\rangle$, $\nabla f(4,1) = \langle 1, 8\rangle$. Max rate of change $|\nabla f(4,1)| = \sqrt{65}$

22. $\nabla = \langle t^2 e^{st}, (st+1)e^{st}\rangle$. $\nabla f(0,2) = \langle 4, 1\rangle$. Max change is $|\nabla f(0,2)| = \sqrt{17}$.