HW (due 4/4) 4.1: 2, 9, 11, 14, 24, 27, 28, 31; 4.2, 1. 13. 28-34

$f(x, y) = ln(xy)$.

$\nabla f(x, y) = Df(x, y) = (\frac{1}{x}, \frac{1}{y})$

$$Hf(x, y) = \begin{pmatrix} -x^{-2} & 0 \\ 0 & -y^{-2} \end{pmatrix}$$

Let $\mathbf{a} = (1, 1)$

Then the tangent plane to $f(x, y) = ln(x, y)$ at $\mathbf{a} = (1, 1)$ is

$$p_1(x, y) = f(1, 1) + Df(1, 1) \begin{pmatrix} x - 1 \\ y - 1 \end{pmatrix} = 0 + (1, 1) \begin{pmatrix} x - 1 \\ y - 1 \end{pmatrix}$$

$= x - 1 + y - 1 = x + y - 2.$

$p_2(x, y) = f(\mathbf{a}) + Df(\mathbf{a})(\mathbf{x} - \mathbf{a}) + \frac{1}{2}(\mathbf{x} - \mathbf{a})^T Hf(\mathbf{a})(\mathbf{x} - \mathbf{a}) =$