$$\sqrt{y+\cos^2 x} \approx 1+\frac{1}{2}y$$

$$\frac{\partial z}{\partial x} = \frac{\frac{1}{2}\cdot 2\cos x(-\sin x)}{\sqrt{y+\cos^2 x}}\Bigg|_{x=0} = 0 \qquad \sqrt{y+\cos^2 x}\,\Big|_{(0,0)} = 1$$

$$\frac{\partial z}{\partial y} = \frac{1\cdot 1}{2\sqrt{y+\cos^2 x}}\Bigg|_{(0,0)} = \frac{1}{2}$$

$$z-1 = 0(x-0)+\frac{1}{2}(y-0)$$

$$z = 1+\frac{1}{2}y$$

20. Find the linear approximation of the function $f(x, y) = \ln(x - 3y)$ at $(7, 2)$ and use it to approximate $f(6.9, 2.06)$. Illustrate by graphing f and the tangent plane.

$$f(x,y) = \ln(x-3y)\Big|_{(7,2)} = 0$$

$$f_x = \frac{1}{x-3y}\Bigg|_{(7,2)} = 1$$

$$f_y = \frac{-3}{x-3y}\Bigg|_{(7,2)} = -3$$

$$z = (x-7)-3(y-2)$$

$$= -.1 - .18$$

$$= -.28$$

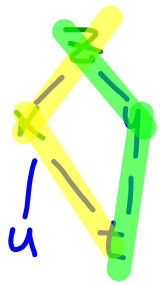
$y = 2x^2 + 5, \quad x = \sin t$

$$\frac{dy}{dt} = \frac{dy}{dx} \cdot \frac{dx}{dt}$$

$z = \cos(xy), \quad x = 2u - 3t, \quad y = e^{t^2} + 1$

$$\frac{\partial z}{\partial t} = -y\sin(xy)(-3) - x\sin(xy)(2t)\left(e^{t^2}\right)$$

$$\frac{\partial z}{\partial x} \cdot \frac{\partial x}{\partial t} + \frac{\partial z}{\partial y} \cdot \frac{dy}{dt}$$



11. $z = e^r \cos\theta, \quad r = st, \quad \theta = \sqrt{s^2 + t^2}$

$$\frac{\partial z}{\partial t}$$