Lab 5

Find the limits, or show that they do not exist:

$$\lim_{(x,y)\to(0,0)} \frac{xy+y^2}{x^2+y^2}$$

$$\lim_{(x,y)\to(0,0)} \frac{x^3-xy^2}{x^2+y^2}$$

$$\lim_{(x,y)\to(0,0)} \frac{x^4y-xy^4}{x^2+xy+y^2}$$

$$\lim_{(x,y)\to(0,0)} \frac{x^2y}{x^3+y^3}$$

$$\lim_{(x,y)\to(0,0)} \frac{2x^3y}{x^6+y^2}$$

$$\lim_{(x,y)\to(0,0)} \frac{x^3}{x^2+y^2}$$

Given the function $z = e^x \cos y$ where x and y are both functions of t, implicitly defined by the following equations respectively:

$$x^3 + e^x - t^2 = 1 \qquad\qquad y^2 t + \ln y = 0$$

Find $\frac{dz}{dt}|_{t=0}$ and $\frac{d^2z}{dt^2}|_{t=0}$