Answer the following problems. No calculators, formula sheets, or other aids are permitted. Please show all of your work. Simplify all solutions completely and clearly indicate your answers.

1. Evaluate the following limit if exists.

$$\lim_{(x,y)\to(0,0)} \frac{x-4y}{6y+7x}$$

Let $x=0$: $\quad \lim_{y\to 0} \frac{-4y}{6y} = \frac{-4}{6} = \frac{-2}{3}$

Let $y=0$: $\quad \lim_{x\to 0} \frac{x}{7x} = \frac{1}{7}$

$\frac{-2}{3} \neq \frac{1}{7}$ so the limit DNE.

2. Find the 1st order partial derivative $\frac{\partial w}{\partial x}$ of the following function.

$$w(x,y,z) = \cos(x^2 + 2y) - e^{5x - z^3 y} + y^3$$

* treat y, z as constants:

$\frac{\partial w}{\partial x} = -2x\sin(x^2 + 2y) - 5e^{5x - z^3 y}$