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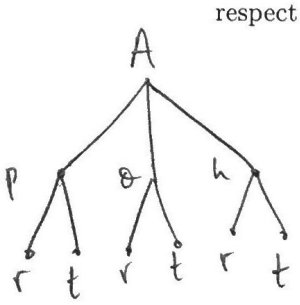
# MAT 226 (Fall 2019)
## Quiz 3

The amount of anesthetic medication $A$ given to a patient undergoing surgery is computed by anesthesiologists as a function $A = A(p, o, h)$ that depends on the patient's blood pressure $p$, oxygenation level $o$, and hydration level $h$. In turn, these quantities depend on the patient's vital signs, namely heart rate $r$ and temperature $t$, that is, in symbols,

$$p = p(r,t), \qquad o = o(r,t), \qquad h = h(r,t).$$

1. **(5 pts)** Find formulas for the rates of change of anesthetic medication given with respect to a variation in heart rate and temperature; that is, compute $\frac{\partial A}{\partial r}$ and $\frac{\partial A}{\partial t}$.




$$\frac{\partial A}{\partial r} = \frac{\partial A}{\partial p}\frac{\partial p}{\partial r} + \frac{\partial A}{\partial o}\frac{\partial o}{\partial r} + \frac{\partial A}{\partial h}\frac{\partial h}{\partial r}$$

$$\frac{\partial A}{\partial t} = \frac{\partial A}{\partial p}\frac{\partial p}{\partial t} + \frac{\partial A}{\partial o}\frac{\partial o}{\partial t} + \frac{\partial A}{\partial h}\frac{\partial h}{\partial t}$$

2. **(5 pts)** Suppose that during surgery, a patient's blood pressure, oxygenation level, and heart rate behave as follows:

$$p(r,t) = r, \qquad o(r,t) = r + t, \qquad h(r,t) = 100.$$

Due to the patient's overall health, it is known that $\frac{\partial A}{\partial p} = 4$, $\frac{\partial A}{\partial o} = -1$, and $\frac{\partial A}{\partial h} = 2$. Find the rate of change of $A$ with respect to $r$ and $t$ for this patient; in other words, compute $\frac{\partial A}{\partial r}$ and $\frac{\partial A}{\partial t}$. *Note: Your answer for each of these should be a number.*

$$\frac{\partial A}{\partial r} = 4\frac{\partial p}{\partial r} - \frac{\partial o}{\partial r} + 2\frac{\partial h}{\partial r} = 4 \cdot 1 - 1 + 2 \cdot 0 = \boxed{3}$$

$$\frac{\partial A}{\partial t} = 4\frac{\partial p}{\partial t} - \frac{\partial o}{\partial t} + 2\frac{\partial h}{\partial t} = 4 \cdot 0 - 1 + 2 \cdot 0 = \boxed{-1}$$