MA 224 - Quiz 7

SOLUTIONS

NOTE: My solution for a given problem is not necessarily the only correct way to do that problem; I accept any method of solving the problems that follows the instructions and uses material taught in this course. I give a lot of detail to make sure everything is clear—I don't expect you to give quite this much detail.

1. (5 pts) Give the domain of $g(s,t)$:

$$g(s,t) = \ln\left(\frac{t+1}{\sqrt{s-1}}\right)$$

   The inside of ln can never be 0 or negative, so we set $0 < \frac{t+1}{\sqrt{s-1}}$. Since square roots are always positive, we can multiply both sides by $\sqrt{s-1}$ to clear the denominator, without having to flip the $<$ sign: $0 < t+1$. Hence we have that the domain must satisfy $-1 < t$.

   Next, note that we can't divide by 0, so $\sqrt{s-1} \neq 0$, which gives $s - 1 \neq 0$, i.e. the domain must also satisfy $s \neq 1$.

   Finally, the inside of the square root can't be negative, so we have $s - 1 \geq 0$, so $s \geq 1$. Combining these last two tells us that the domain must satisfy $s > 1$.

   So the domain is all points (s,t) that satisfy $-1 < t$ and $s > 1$.

2. (5 pts) Find h_{vu} if $h(u,v) = uv\ln(vu)$. Make sure you **simplify**.

   First find h_v:

$$\begin{aligned} h &= uv\ln(vu) \\ h_v &= u\ln(vu) + uv \cdot \left(\frac{1}{vu}\right) \cdot u && \text{product rule and chain rule!} \\ &= u\ln(vu) + u && \text{simplify} \end{aligned}$$

$$\begin{aligned} h_{vu} &= \ln(vu) + u \cdot \left(\frac{1}{vu}\right) \cdot v + 1 && \text{product rule and chain rule, again!} \\ &= \ln(vu) + 2 && \text{simplify!} \end{aligned}$$