GP211. Open book! 12 minutes. November 17, 2011. Your name here _____

Let $\mathbf{H}$ be an operator that converts impulses into hyperbolas. Depending on various details of the definition of $\mathbf{H}$, its adjoint is known as downward continuation or migration. A damped inversion is

$$0 \quad \approx \quad \begin{bmatrix} \mathbf{r}^{(d)} \\ \mathbf{r}^{(m)} \end{bmatrix} \quad = \quad \begin{bmatrix} \mathbf{H} \\ \epsilon \mathbf{I} \end{bmatrix} \mathbf{m} \; - \; \begin{bmatrix} \mathbf{d} \\ \mathbf{0} \end{bmatrix} \tag{1}$$

1. What is the gradient $\Delta\mathbf{m}$?

2. What is the gradient $\Delta\mathbf{m}$ for the hybrid convex function $C(r)$ with derivative $C_i' = C'(r_i)$? You could derive it, but quicker to write it down from memory.

3. Given $\Delta\mathbf{m}$, what are the updates to the residual, $\Delta\mathbf{r}^{(d)}$ and $\Delta\mathbf{r}^{(m)}$?

4. What is the best value of α for the model update $\mathbf{m} = \mathbf{m} + \alpha\Delta\mathbf{m}$ (when C is the penalty function)?

If you've passed the quiz, you can forget all you've learned about conjugate directions and do a hybrid migration inversion based on your answers.