

HW 3

1: Bent lines Suppose we are given noisy data generated from the function

$$f(x) = \max(\alpha_1 x + \beta_1, \alpha_2 x + \beta_2),$$

i.e. we have points $\{(x_j, y_j)\}$ where $y_j = f(x_j) + \epsilon_j$, with ϵ_j a noise variable. Write a routine to find values for $\alpha_1, \beta_1, \alpha_2, \beta_2$ that yield the smallest possible residual in a least squares sense:

```
1 function [alphas, betas] = hw3_fit_broken(x, y)
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2: On reflection Write a routine to compute a Householder reflector for polynomials of degree at most d , under the inner product

$$\langle p, q \rangle = \int_0^1 p(x)q(x) dx$$

Your reflector should map a given polynomial to a positive constant.

```
1 function [u] = hw3_householder(c)
2 %
3 % Given a polynomial  $p(x) = c(1) + c(2)*x + c(3)*x^2 + \dots$ , find
4 % a polynomial  $q(x) = u(1) + u(2)*x + u(3)*x^2 + \dots$  such that
5 %
6 %  $p(x) - 2 q(x) \langle q(x), p(x) \rangle = \text{constant}$ 
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