Class 1 assignment

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Definition

A linear function $f(x)$ is one with the property

$$f(ax_1 + bx_2) = af(x_1) + bf(x_2)$$

Problems

1. Prove that $f(x) = \beta x$ is linear.

$$f(ax_1 + bx_2) = af(x_1) + bf(x_2)$$
$$= a\beta x_1 + b\beta_2$$
$$= \beta a x_1 + \beta b x_2$$
$$= af(x_1) + bf(x_2)$$

qed.

2. Prove that
$$f(x) = \beta_0 + \beta_1 x + \beta_2 x^2$$

is *not* linear.

$$f(x) = \beta_0 + \beta_1 x + \beta_2 X^2$$
$$f'(x) = \beta_1 x + beta_2 2 x_2$$
$$f''(x) = \beta_2 * 2$$

Thereby it is not linear as the beta coefficients is not linear - Therefore we look at the coefficients instead.

$$f(\beta) = \beta_0 + \beta_1 x + \beta_2 X^2$$
$$f(\beta) = 1 + x_1 + x_2^2$$
$$f''(\beta) = 0$$

qed