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Problem Set 1
AI at 5:25 PM

January 20, 2021

1. Formula: $\bar{x} = \frac{\sum_i x_i}{n}$
   Steps: take the sum of the numbers in the set divided by the amount of numbers in the set
   Solution: $\bar{z} = 23.571$

2. Formula: $x_{resid} = x_i - \bar{x}$
   Steps: take the original set and subtract the mean from all values in the set to get the residual matrix
   Solution: $z_{resid} = \begin{bmatrix} -16.571 & -21.571 & 26.429 & -22.571 & 76.429 & -20.571 & -21.571 \end{bmatrix}$

3. Formula: $s^2 = \frac{\sum_i (x_i - \bar{x})^2}{n-1}$
   Steps: take the sum of each number - mean squared and then divide that value by n-1
   Solution: $s^2 = 1446.286$

4. s represents the standard deviation of a set, s measures the diversity of a set relative to its mean.

5. The standard deviation of the set is 38.03 neither the max of the set nor the min are 3 standard deviations or more from the mean, therefore there are no outliers.

6. Formula: $\frac{d}{dx}(x^n) = nx^{n-1}$
   and $\frac{d}{dx}(x) = 1$
   Steps: use the formulas above as shown respectively where needed
   Solution: simply first
   $x^2 + 2\beta^3 + \beta^2 + x^2 - 2x\beta + x\beta$
   then take the derivative with respect to β
   $\frac{d}{d\beta}(f(\beta)) = x^2 + 6\beta^2 + 2\beta + x^2 - 2x + x$
   $= 2x^2 + 6\beta^2 + 2\beta - x$

7. Formula: $\frac{d}{dx}(x^n) = nx^{n-1}$
   and $\frac{d}{dx}(x) = 1$
   Steps: use the formulas where needed to find the derivative then find the minimum once the derivative is found
   Solution: $\frac{d}{d\beta}(f(\beta)) = 2\beta - 10 = 0$
   $2(5) - 10 = 0$
   The minimum is 5

8. Formula: $AB = [C_{ij}], C_{ij} = A_{i1} * B_{1j} + A_{i2} * B_{2j} + ... + A_{in} * B_{nj}$
   Steps: to get AB_{ij} multiply each value down row i on A by each value down column j on B, do this for each row and column on both matrices for a finished product
   Solution: $\begin{bmatrix} 20 & 13 \\ 19 & 18 \end{bmatrix}$