Homework #1

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Problem 1:

$f(x) = \exp(-\frac{1}{2\sigma^2}(x-\mu)^2)$

$f'(x) = (\exp(-\frac{1}{2\sigma^2}(x-\mu)^2))'$

Applying Chain Rule and $(\exp(x))' = \exp(x)$:

$f'(x) = \exp(-\frac{1}{2\sigma^2}(x-\mu)^2)(-\frac{1}{2\sigma^2}(x-\mu)^2)'$

Applying Constant Rule:

$f'(x) = \exp(-\frac{1}{2\sigma^2}(x-\mu)^2) \cdot -\frac{1}{2\sigma^2}((x-\mu)^2)'$

Applying Chain Rule and $(x^2)' = 2x$:

$f'(x) = \exp(-\frac{1}{2\sigma^2}(x-\mu)^2) \cdot -\frac{1}{2\sigma^2} \cdot 2(x-\mu)(x-\mu)'$

Applying Sum Rule

$f'(x) = \exp(-\frac{1}{2\sigma^2}(x-\mu)^2) \cdot -\frac{1}{2\sigma^2} \cdot 2(x-\mu)(x' + (-\mu)')$

Applying Constant Rule and $(x)' = 1$:

$f'(x) = \exp(-\frac{1}{2\sigma^2}(x-\mu)^2) \cdot -\frac{1}{2\sigma^2} \cdot 2(x-\mu)(1+0)$

$f'(x) = \exp(-\frac{1}{2\sigma^2}(x-\mu)^2) \cdot -\frac{1}{2\sigma^2} \cdot 2(x-\mu)$