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18. To find the sum of the series $\sum_{n=0}^{\infty} \frac{n^2}{2^n}$, express $\frac{1}{1-x}$ as a geometric series, differentiate both sides of the resulting equation with respect to x, multiply both sides of the result by x, differentiate again, multiply by x again, and set x equal to $\frac{1}{2}$.

Express $\frac{1}{1-x}$ as a geometric series.

$\frac{1}{1-x} = \sum_{n=0}^{\infty}$ x^n (Type an expression using x as the variable.)

Differentiate both sides of the resulting equation with respect to x. Begin with the left side of the equation.

$\frac{d}{dx}\left(\frac{1}{1-x}\right) =$ $\frac{1}{(1-x)^2}$

Differentiate the right side of the equation.

$\frac{d}{dx}\left(\sum_{n=0}^{\infty}\right.$ x^n $\left.\right) = \sum_{n=1}^{\infty}$ nx^{n-1} (Type expressions using x as the variable.)

Multiply both sides of the result by x and differentiate again. Begin with the left side of the equation.

$\frac{d}{dx}\left(\frac{x}{(1-x)^2}\right) =$ $-\frac{x+1}{(x-1)^3}$

Differentiate the right side of the equation.

$\frac{d}{dx}\left(\sum_{n=0}^{\infty}\right.$ nx^n $\left.\right) = \sum_{n=1}^{\infty}$ n^2x^{n-1} (Type expressions using x as the variable.)

Multiply by x again, and set x equal to $\frac{1}{2}$.

$\sum_{n=0}^{\infty} \frac{n^2}{2^n} =$ 6