

2. Binomialreihe:  $n=1 \Rightarrow p$

$$2: \sum_{k=0}^n \binom{n}{k} p^k (1-p)^{n-k} \Rightarrow \frac{d}{dt} \left( \sum_{k=0}^n \binom{n}{k} (tp)^k (1-p)^{n-k} \right) = \frac{d}{dt} \left( (1-p+tp)^n \right)$$

$$k = \frac{d}{dt} (t^k)$$

$$= (n(1-p+tp)^{n-1} p) \Big|_{t=1} = \boxed{np}$$

3. Geometrische Reihe:

$$= x = \sum_{k=0}^{\infty} p(1-p)^{k-1} = p \sum_{k=0}^{\infty} p^k q^{k-1} = p \sum_{k=0}^{\infty} \frac{d}{dq} (q^k) = p \frac{d}{dq} \left( \frac{1}{1-q} \right) = p \frac{1}{(1-q)^2} =$$

$$= p \frac{1}{p^2} = \boxed{\frac{1}{p}}$$