2. Übung:

(2)

$$\sum_{k=1}^{n} k\cdot(k+1) = \frac{1}{3}\cdot n^3 + n^2 + \frac{2}{3}\cdot n$$

$$\frac{1}{3}\cdot n\cdot(n+1)\cdot(n+2) = \frac{1}{3}\cdot n^3 + n^2 + \frac{2}{3}\cdot n$$

$$\sum_{k=1}^{n+1} k\cdot(k+1) = \sum_{k=1}^{n} k\cdot(k+1) + (n+1)\cdot(n+2)$$

$$\sum_{k=1}^{n} k\cdot(k+1) + (n+1)\cdot(n+2) = \frac{1}{3}\cdot(n+3)\cdot(n+2)\cdot(n+1)$$

qed

(4)

FORMEL $\frac{1-q^{n+1}}{1-q}$

$$\sum_{i=0}^{10} 3^i = 8.857\times 10^4$$

$$\frac{1-3^{11}}{1-3} = 8.857\times 10^4$$

$$\sum_{j=6}^{12} 2^{-j} = 0.031006$$

$$2^{-6} + 2^{-7} + 2^{-8} + 2^{-9} + 2^{-10} + 2^{-11} + 2^{-12} = 0.031006$$

$$2^{-12}\cdot\left(2^0 + 2^1 + 2^2 + 2^3 + 2^4 + 2^5 + 2^6\right) = 0.031006$$

$$2^{-12}\cdot\frac{\left(1-2^{6+1}\right)}{1-2} = 0.031006$$

$$\sum_{k=3}^{n+2} (-x)^k = \frac{-(-x)^{(n+3)}}{(1+x)} - \frac{x^3}{(1+x)} = x^3 \cdot \frac{\left[(-x)^n - 1\right]}{(1+x)}$$

$$\sum_{l=2}^{7} \left(\frac{y}{3}\right)^l = \frac{1}{9}\cdot y^2 + \frac{1}{27}\cdot y^3 + \frac{1}{81}\cdot y^4 + \frac{1}{243}\cdot y^5 + \frac{1}{729}\cdot y^6 + \frac{1}{2187}\cdot y^7$$

$$\frac{1}{9}\cdot y^2 \cdot \left[\frac{1 - \left(\frac{y}{3}\right)^{5+1}}{1 - \frac{y}{3}}\right] = \frac{1}{2187}\cdot y^7 + \frac{1}{729}\cdot y^6 + \frac{1}{243}\cdot y^5 + \frac{1}{81}\cdot y^4 + \frac{1}{27}\cdot y^3 + \frac{1}{9}\cdot y^2$$

(5)

$$(x + 2\cdot y)^5 = x^5 + 10\cdot x^4\cdot y + 40\cdot x^3\cdot y^2 + 80\cdot x^2\cdot y^3 + 80\cdot x\cdot y^4 + 32\cdot y^5$$

$$(1 + 3\cdot x)^{17} = 1 + 51\cdot x + 1224\cdot x^2 + 18360\cdot x^3 + 192780\cdot x^4 + 1503684\cdot x^5 + 9022104\cdot x \ \ldots$$

die ersten 5 Koeffizienten!

$$\sum_{k=0}^{n} \frac{n!}{k!\cdot(n-k)!}\cdot -1^{n-k} = -2^n \qquad \sum_{k=0}^{n} \frac{n!}{k!\cdot(n-k)!} = 2^n$$

6a

Kombinationen für 4 Elemente

k=1 $\frac{4!}{1!\cdot 3!} = 4$ k=2 $\frac{4!}{2!\cdot 2!} = 6$

k=3 $\frac{4!}{3!\cdot 1!} = 4$ k=4 $\frac{4!}{0!\cdot 4!} = 1$

6c Es gibt $\frac{(7)!}{4!\cdot(7-4)!} = 35$ Kombinationen