

S.151, Nr.1)

$$\begin{aligned}f(x) &= ax^3 + bx^2 + cx + d \\f'(x) &= 3ax^2 + 2bx + c \\f''(x) &= 6ax + 2b\end{aligned}$$

a)

1. Info:  $P(1/2) \in f \Rightarrow f(1) = 2 \Rightarrow a + b + c + d = 2$
2. Info:  $P$  ist Extremum  $\Rightarrow f'(1) = 0 \Rightarrow 3a + 2b + c = 0$
3. Info:  $W(0/0) \in f \Rightarrow f(0) = 0 \Rightarrow \underline{\underline{d = 0}}$
4. Info:  $W$  ist Wendepunkt  $\Rightarrow f''(0) = 0 \Rightarrow 2b = 0 \Leftrightarrow \underline{\underline{b = 0}}$

$$\Rightarrow \text{I: } a + c = 2 \quad \wedge \quad \text{II: } 3a + c = 0 \quad \Leftrightarrow \quad \left( \begin{array}{cc|c} 1 & 1 & 2 \\ 3 & 1 & 0 \end{array} \right) \Rightarrow \text{TR: } \underline{\underline{a = -1}} \quad \wedge \quad \underline{\underline{c = 3}}$$

$$\underline{\underline{f(x) = -x^3 + 3x}}$$

b)

1. Info:  $(0/0) \in f \Rightarrow f(0) = 0 \Rightarrow \underline{\underline{d = 0}}$
2. Info:  $(0/0)$  ist Extremum  $\Rightarrow f'(0) = 0 \Rightarrow \underline{\underline{c = 0}}$
3. Info:  $P(2/4) \in f \Rightarrow f(2) = 4 \Rightarrow 8a + 4b = 4$
4. Info:  $P$  ist Extremum  $\Rightarrow f'(2) = 0 \Rightarrow 12a + 4b = 0$

$$\Leftrightarrow \left( \begin{array}{cc|c} 8 & 4 & 4 \\ 12 & 4 & 0 \end{array} \right) \Rightarrow \text{TR: } \underline{\underline{a = -1}} \quad \wedge \quad \underline{\underline{b = 3}}$$

$$\underline{\underline{f(x) = -x^3 + 3x^2}}$$