1) $f(x) = 3 \cdot e^{(4-2x)^2}$ -> Extremstelle

2) $f(x) = \frac{1}{3}x^3 - 4x^2 + 12x - 10$ -> Wendestelle

3) $f(x) = \frac{\ln(3x) - 4}{\sin(4-2x)}$

4) $f(x) = \sqrt[3]{4-2x} \cdot e^{5x^2}$

5) $f(x) = \ln\left[(4-x^2)^5 + 1\right]$ -> Extremstelle

1) $f(x) = 3 \cdot e^{(4-2x)^2}$

e-Funktion : $e^{(4-2x)^2} \rightarrow e^{(4-2x)^2}$

Potenz : $(4-2x)^2 \rightarrow 2\cdot(4-2x)^1$

Linear : $4-2x \rightarrow -2$

$$f'(x) = 3 \cdot e^{(4-2x)^2} \cdot 2\cdot(4-2x) \cdot (-2)$$

$$f'(x) = -12 \cdot (4-2x) \cdot e^{(4-2x)^2} = 0$$

$-$ $\quad$ <0 $\quad$ >0

$x = 2$, $f(2) = 3 \cdot e^{(4-4)^2} = 3$

$f'(0) = -12 \cdot (4) \cdot e^{4^2} < 0$ $\quad$ (>0)

$f'(3) = -12 \cdot (-2) \cdot e^{4} > 0$

} TP (2|3)

$$f'(x) = \underbrace{(-48+24x)}_{u} \cdot \underbrace{e^{(4-2x)^2}}_{v}$$

$$f''(x) = 24 \cdot e^{(4-2x)^2} + (-48+24x) \cdot e^{(4-2x)^2} \cdot 1/3$$

$u = -48+24x \qquad u' = 24$

$v = e^{(4-2x)^2} \qquad v' = (-48+24x) \cdot e^{(4-2x)^2} \cdot 1/3$

$$f''(2) = 24 \cdot e^0 + 0 \cdot e^{0 \cdot 1/3} = 24 > \quad TP$$

$$f(x) = 3 \cdot e^{(4-2x)^2}$$

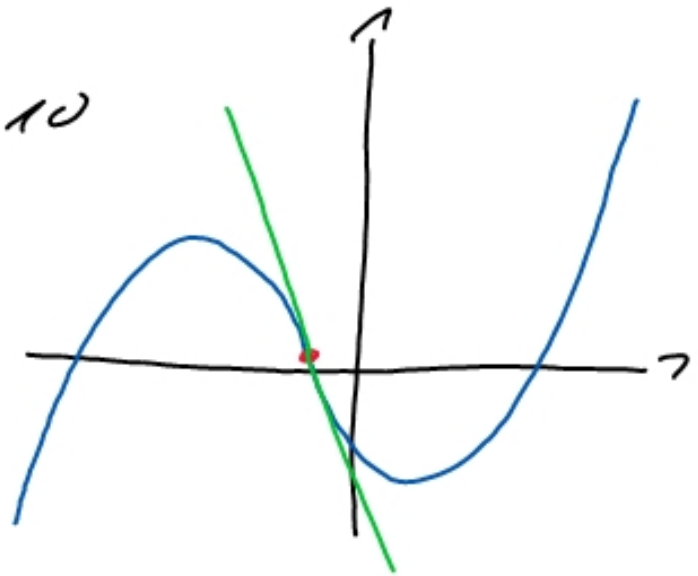
$$f'(x) = (24x - 48) \cdot e^{(4-2x)^2}$$

$$f''(x) = 24 \cdot e^{(4-2x)^2} + (24x - 48) \cdot \left[e^{(4-2x)^2} \right]'$$

$$- \; \cdot \qquad + (24x - 48) \cdot \left[(24x - 48) \cdot e^{(4-2x)^2} \cdot \tfrac{1}{3} \right]$$

$$- \; \cdot \qquad + \tfrac{1}{3} \cdot (24x - 48)^2 \cdot e^{(4-2x)^2}$$

2) $f(x) = \frac{1}{3}x^3 - 4x^2 + 12x - 10$



$f'(x) = x^2 - 8x + 12$

$f''(x) = 2x - 8$

$f''(x) = 0 \quad \Rightarrow \quad x = 4$

$f(4) = \frac{64}{3} - 64 + 48 - 10 = -\frac{14}{3} = y$

$f'(4) = 16 - 32 + 12 = -4 = m$

$y = m \cdot x + b \quad \Rightarrow \quad -\frac{14}{3} = -4 \cdot 4 + b$

$b = \frac{34}{3}$

$y = -4 \cdot x + 11\frac{1}{3}$