

30) Determine the derivatives of the following functions:

1. $x^4 + 3x^2 - x + 1$
2. $\cos(x + 1)$
3. $\text{bla}(5x)$ (with $\text{bla}'(x) = (\exp(x) - 1)/x$)
4. $\sqrt[3]{2x + 2}$
5. $\sin(x) \cdot \exp(x)$
6. $\frac{5x^4 + 2}{3x^2 - x + 1}$
7. $\text{bla}(\sin(x^2 + 2))$
8. $(\sin(x) + x)^4$

31) Calculate the second derivative of $x^2 \cdot \sin(x)$.

32) For a function $f: \mathbb{R} \rightarrow \mathbb{R}$ the following information about its derivatives is known: $f'(x_0) = 0$ for $x_0 = 1, 3, 5, 7$. $f''(x_0) = 0$ for $x_0 = 2, 4, 5, 6$. And $f'(0) > 0$

- a) Classify the critical points of f on being (local) maximum, minimum, or saddle.
- b) Determine the turning points of f that are not saddle.
- c) Sketch a graph for f under the assumption that $f(0) = 10$.
- d) Sketch a graph for f under the assumption that $f(0) = -10$.

33) For each of the following functions, find the critical points and turning points. Classify the critical points according to being local maximum/minimum/saddle.

- a) $6x^2 - x^3$.
- b) $\frac{x}{x^2+1}$
- c) $-x^4 + 6x^2 - 4$.

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