

Intervals of monotonicity and local extrema

Determine the intervals of monotonicity, find local extrema (and determine their types) of following functions:

1. $f(x) = 3x - x^3$
2. $f(x) = x^2 - \ln(x^2)$
3. $f(x) = x^2 e^x$
4. $f(x) = x + \sin x$
5. $f(x) = \sin(x^2)$ on restricted domain $x \in \langle -\frac{\pi}{2}; \frac{\pi}{2} \rangle$

Absolute extrema

Decide if the absolute extrema (min., max.) of the following functions exist on the given intervals (I). If so, find them.

6. $f(x) = x^3 - 3x^2 - 9x + 35$, $I = \langle -4; 4 \rangle$
7. $f(x) = x^2 \ln x$, $I = \langle 1; e \rangle$
8. $f(x) = \frac{x^2+4}{x}$, $I = (0; 3)$

Asymptotes

Determine all possible asymptotes of following functions:

9. $f(x) = \frac{\ln x}{x^2-2} + 2$
10. $f(x) = \sqrt{x+x^2}$
11. $f(x) = \frac{x^3}{4-x^2}$