

### (Intervals of monotonicity and local extrema)

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

1.  $f(x) = x^2 e^x$

2.  $f(x) = x + \sin x$

3.  $f(x) = \sin(x^2)$  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.

4.  $f(x) = x^3 - 3x^2 - 9x + 35$ ,  $I = \langle -4; 4 \rangle$

5.  $f(x) = x^2 \ln x$ ,  $I = \langle 1; e \rangle$

6.  $f(x) = \frac{x^2+4}{x}$ ,  $I = \langle 0; 3 \rangle$

### Asymptotes

Determine all possible asymptotes of following functions:

7.  $f(x) = \frac{\ln x}{x^2-2} + 2$

8.  $f(x) = \sqrt{x+x^2}$

9.  $f(x) = \frac{x^3}{4-x^2}$