

prerequisite of Mat132

Note: The error in problem 2 has been fixed.

- (1) Calculate the following limits.

(a)

$$\lim_{x \rightarrow -2} \frac{x^3 + 2x^2 - 1}{5 - 3x}$$

(b)

$$\lim_{x \rightarrow 1} \arcsin \left(\frac{1 - \sqrt{x}}{1 - x} \right)$$

(c)

$$\lim_{x \rightarrow \infty} \frac{x^3 + 5x}{2x^3 - x^2 + 4}$$

(d)

$$\lim_{x \rightarrow 2} \frac{x - 2}{|x - 2|}$$

- (2) For which value of a the function

$$f(x) = \begin{cases} x + 1, & x \leq 1 \\ 3 - ax^2, & x > 1 \end{cases}$$

is continuous?

- (3) Find the equation of the tangent line to the graph of $y = \sqrt{x + 1}$ at point $x = 8$.
- (4) Calculate the derivatives of the following functions.

(a)

$$y = x \cdot 3^x$$

(b)

$$\frac{x^4 - 2x^2 + 1}{x^2 - 1}$$

(c)

$$y = \cot \sqrt{x^2 + 1}$$

- (5) For each of the following functions, find intervals of increasing and decreasing, intervals of concavity, asymptotes (vertical, horizontal and oblique), points of local extrema, inflection points and draw the graph.

$$y = \frac{x^2 - 1}{x^2 - 4}$$

- (6) Find the equation of the tangent line to the curve $x^2 + y^3 + x \ln y = 1$ at the point $x = 1, y = 1$.