

# EXAM I – MATH 135, SPRING 2008

**READ EACH PROBLEM CAREFULLY!** To get full credit, you must show all work!

The exam has 8 problems on 4 pages! Turn in all pages!

**NO GRAPHING CALCULATORS ALLOWED!**

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• **Problem 1**

Consider the function

$$f(x) = \frac{x^2 - 1}{x^2 - x - 2}$$

(a) Determine the domain of  $f$ .

(b) Find **all vertical and horizontal asymptotes** of the graph  $y = f(x)$ . Explain!

• **Problem 2**

Evaluate the limit

$$\lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x - 1} =$$

- **Problem 3**

Using the precise  $(\varepsilon - \delta)$  definition of the limit, prove that

$$\lim_{x \rightarrow -1} (3x + 4) = 1$$

- **Problem 4**

Find the limit

$$\lim_{x \rightarrow \infty} (x - \sqrt{x^2 - 2x})$$

- **Problem 5**

Consider the function

$$f(x) = \begin{cases} x + 2, & \text{if } x < 0 \\ x^2 - 1, & \text{if } 0 \leq x < 2 \\ 3, & \text{if } x \geq 2 \end{cases}$$

Determine the points where  $f$  is discontinuous, if any. Give reasons!

- **Problem 6**

Using the **limit definition of the derivative**, find  $f'(x)$ , where

$$f(x) = \sqrt{x + 3}$$

- **Problem 7**

Find the **equation of the tangent line** to the parabola  $y = x^2 - 4x + 5$  at the point  $P(1, 2)$ .

- **Problem 8**

Differentiate the function

$$h(x) = \frac{x + 1}{x^2 + 3}$$

and determine the points where the tangent line to the graph  $y = h(x)$  is horizontal.