

**Quiz 1**  
**Math 31–6429**

You should fully justify your answers. Do all your work on separate paper, and make sure to *print* your name in the first sheet and staple all the sheets together. **Unstapled, loose pieces of paper will not be graded.** This quiz is due on Tuesday, September 11, at 6:00pm.

1. Compute the following limits. If you think that a certain limit doesn't exist, state so and explain why.

(a)  $\lim_{x \rightarrow 2} \frac{x^2 - x - 2}{x^2 + x - 6}$ .

(b)  $\lim_{x \rightarrow -4} \frac{|x + 4|}{x + 4}$ .

(c)  $\lim_{h \rightarrow 0} \frac{(3 + h)^2 - 9}{h}$ .

(d)  $\lim_{t \rightarrow 4} \frac{\sqrt{t} - 2}{\sqrt{t} - 4}$ .

**Hint.** You might want to rationalize the numerator. Think of conjugate expressions.

(e)  $\lim_{x \rightarrow 0} \cos \frac{1}{x}$ .

(f)  $\lim_{x \rightarrow \pi/2^-} \tan x$ .

(g)  $\lim_{x \rightarrow 1} \frac{1}{(x - 1)^5}$ .

(h)  $\lim_{x \rightarrow 0} x \sin \frac{1}{x}$ .

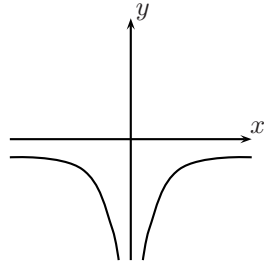
2. Let

$$f(x) = \begin{cases} ax^2 - 3x + 4 & \text{if } x \leq 2 \\ x + 3a & \text{if } x > 2 \end{cases}$$

Find the real number  $a$  so that  $\lim_{x \rightarrow 2} f(x)$  exists.

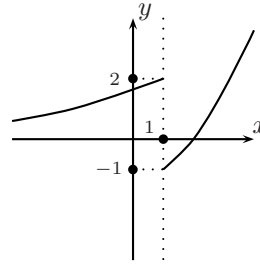
3. By examining the graphs calculate the required limits. If you think that a certain limit doesn't exist state so.

a)



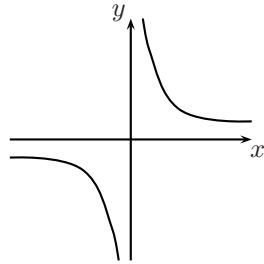
$$\begin{aligned}\lim_{x \rightarrow 0^+} f(x) &= \\ \lim_{x \rightarrow 0} f(x) &= \\ \lim_{x \rightarrow 0^-} f(x) &= \end{aligned}$$

b)



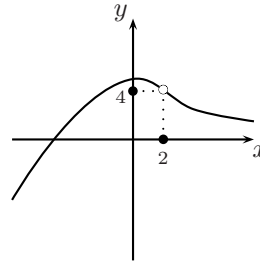
$$\begin{aligned}\lim_{x \rightarrow 1^+} f(x) &= \\ \lim_{x \rightarrow 1} f(x) &= \\ \lim_{x \rightarrow 1^-} f(x) &= \end{aligned}$$

c)



$$\begin{aligned}\lim_{x \rightarrow 0^+} f(x) &= \\ \lim_{x \rightarrow 0} f(x) &= \\ \lim_{x \rightarrow 0^-} f(x) &= \end{aligned}$$

c)



$$\begin{aligned}\lim_{x \rightarrow 2^+} f(x) &= \\ \lim_{x \rightarrow 2} f(x) &= \\ \lim_{x \rightarrow 2^-} f(x) &= \end{aligned}$$