

# Calculus Quiz 1

1. (5 pts)

a. Evaluate the limit  $\lim_{x \rightarrow \frac{1}{n}^+} x \left\lfloor \frac{1}{x} \right\rfloor$  for  $n \in \mathbb{N}$ , and  $\lim_{x \rightarrow 0^+} x \left\lfloor \frac{1}{x} \right\rfloor$ .

b. Is there a number  $a$  such that

$$\lim_{x \rightarrow -2} \frac{3x^2 + ax + a + 3}{x^2 + x - 2}$$

exists? If so, find the value of  $a$  and the value of the limit.

2. (5 pts)

a. Show that  $|\sin x| \leq |x| \leq |\tan x|$  for  $-\frac{\pi}{2} < x < \frac{\pi}{2}$ .

b. Using a. to prove that  $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$ .

c. Derive a formula for area of regular  $n$ -gon inscribed in circle with radius  $r$  and show that the area of the circle is  $\pi r^2$ .