

1. Using the definition of limit determine

$$(a) \lim_{x \rightarrow 0} \frac{(x+1)^2 - 1}{x}$$

$$(b) \lim_{x \rightarrow -1} \frac{x^3 + 1}{x + 1}$$

2. Prove $\lim_{x \rightarrow 0} \sqrt{|x|} \cos \frac{1}{x} = 0$.

3(a) p. 104 # 2

(b) Prove $f(x) = \begin{cases} x^2 & \text{if } x \leq 1 \\ 3 - 2x & \text{if } x > 1 \end{cases}$ is continuous.

(c) p. 104 # 11 (you can use sequence criterion for continuity, if you like.)

4. Suppose f , $f+g$ are continuous functions. Prove g is continuous.

5. Suppose f is continuous at $x=p$ and $f(p) > 0$. Prove $\exists \delta > 0$ st. $\forall x \in (p-\delta, p+\delta)$, $f(x) > 0$.

6. p. 104 # 8

7. Suppose $f: \mathbb{R} \rightarrow \mathbb{R}$ is continuous. Prove $y = |f(x)|$ is continuous.

Bonus 8. p. 105 # 15.