1. Let $A = (-\infty, 0) \bigcup (0, \infty)$. Define $f : A \to \mathbb{R}$ by $f(x) = \sin(\frac{1}{x})$
   (a) Sketch a graph of f
   (b) Use Corollary 4.2.5 to show $\lim_{x \to 0} f(x)$ does not exist

   Hint: Consider $(x_n) = \left(\frac{1}{2\pi n}\right)$ and $(y_n) = \left(\frac{1}{2\pi n + \frac{\pi}{2}}\right)$

2. Prove that $f(x) = 2x + 3$ is continuous at $x = 4$

3. Prove that $g(x) = x^2$ is continuous at $x = 4$

Theorem 4.3.4 (Algebraic Continuity Theorem)

Assume $f : A \to \mathbb{R}$ and $g : A \to \mathbb{R}$ are continuous at $c \in A$. Then

(i) $kf(x)$ is continuous for all $k \in \mathbb{R}$

(ii) $f(x) + g(x)$ is continuous at c

(iii) $f(x)g(x)$ is continuous at c

(iv) $f(x)/g(x)$ is continuous at c if the quotient is defined