Week 4, Due Fri 10/24

(This is shorter due to the midterm.)

1. Spivak, Chapter 5, Problem 26
2. Let $f(x)$ and $g(x)$ be functions with domain $\mathbf{R}$. Determine whether the following statements are true (and give a proof either way):
   (a) If $\lim_{x\to 0} f(x)$ does not exist, and $\lim_{x\to 0} g(x)$ does not exist, then
   $$\lim_{x\to 0} f(x) + g(x)$$
   does not exist.
   (b) If $\lim_{x\to 0} f(x)$ does not exist, and $\lim_{x\to 0} g(x)$ exists, then
   $$\lim_{x\to 0} f(x) + g(x)$$
   does not exist.
   (c) Recall that $g \circ f(x) = g(f(x))$. If $\lim_{x\to 0} f(x)$ exists and equals zero, and $\lim_{x\to 0} g(x)$ exists, then
   $$\lim_{x\to 0} g \circ f(x)$$
   exists. (Be careful.)