Homework 01

1. Section 2.2: 19, 25, 31, 33, 37, 41, 63, 77, 81, 87.

   Remark: For problem 87, just find the limit. Need not plot it. To find the limit, use the algebraic identity '$a^3 \pm b^3 = (a \pm b)(a^2 \mp ab + b^2)$'.

2. Section 2.2: Find $\lim_{x\to 0} \sqrt{|x|}\cos\dfrac{1}{x}$.

3. Section 2.3: problems 35, 43, 49, 53, 54.

4. Section 2.3: Suppose that $f(x)$ is defined on $(c-a, c)\cup(c, c+a)$ for some $a > 0$. If $f(x)$ satisfies the following statement, then is it true that $\lim_{x\to c} f(x) = L$? Prove it if true, find a counter example if not true.

   > For any $\varepsilon > 0$ and any $\delta > 0$, there exists a number $x \in (c-\delta, c)\cup(c, c+\delta)$ such that $|f(x) - L| < \varepsilon$.

5. Section 2.3: Use the $\varepsilon - \delta$ argument to prove the following statement:

   If $\lim_{x\to c} f(x) = L$ and $\lim_{x\to c} g(x) = M$, then $\lim_{x\to c}\Big(4f(x) - 2g(x)\Big) = 4L - 2M$.

   Hint: Note that if $a < b$ then $-a > -b$.