Math 114 Spring 2017
Calculus I HW 5 Solutions
Due Friday, March 3

1. ($\star$) Stewart 1.6.4
2. Stewart 1.6.14
3. Stewart 1.6.18
4. Compute $\lim_{x\to+\infty} x - \sqrt{x}$.

   Solution:
   $$\lim_{x\to+\infty} x - \sqrt{x} = \lim_{x\to+\infty} \sqrt{x}(\sqrt{x} - 1)$$
   and since $\lim_{x\to+\infty} \sqrt{x} = \lim_{x\to+\infty} \sqrt{x} - 1 = +\infty$, we see that $\lim_{x\to+\infty} x - \sqrt{x} = +\infty$.
5. Stewart 1.4.34
6. Stewart 1.4.36
7. ($\star$) Using the squeeze theorem, show that
   $$\lim_{x\to-2} \frac{x+2}{2+\sin\left(\frac{1}{x+2}\right)} = 0.$$

   Solution: We observe that
   $$\begin{aligned} -1 \le \sin\left(\frac{1}{x+2}\right) &\le 1 \\ 1 \le 2 + \sin\left(\frac{1}{x+2}\right) &\le 3 \\ 1 \ge \frac{1}{2+\sin\left(\frac{1}{x+2}\right)} &\ge \frac{1}{3} \ge -1 \\ |x+2| \ge \frac{x+2}{2+\sin\left(\frac{1}{x+2}\right)} &\ge -|x+2| \end{aligned}$$
   Then we compute $\lim_{x\to-2} |x+2| = 0$ and $\lim_{x\to-2} -|x+2| = 0$, so by the Squeeze Theorem,
   $$\lim_{x\to-2} \frac{x+2}{2+\sin\left(\frac{1}{x+2}\right)} = 0.$$

8. Stewart 1.4.50
9. Stewart 1.4.52 (Hint: what trig identities do we know? Can we make one of them show up?)
10. Stewart 1.4.54
11. Stewart 1.5.4
12. ($\star$) Stewart 1.5.6