1. (Sec 11.1 monotone convergence theorem) Recall that *bounded* means bounded above and below.
   (a) True or false? The sequence
   $$\{\sin(n)\}_{n=1}^{\infty}$$
   is bounded. Give upper and lower bounds (if true) or justification (if false).
   (b) True or false? The sequence
   $$\left\{\frac{7n-8}{8n+3}\right\}_{n=1}^{\infty}$$
   is bounded above. Give *an* upper bound (if true) or justification (if false). (Note: see WebAssign no. 7).
   (c) True or false? The sequence
   $$\left\{\frac{7n-8}{8n+3}\right\}_{n=1}^{\infty}$$
   is bounded below. Give *a* lower bound (if true) or justification (if false). (Note: see WebAssign no. 7).
   (d) T or F? Every bounded sequence is convergent. Justify (if T) or give a counterexample (if F).
   (e) T or F? There is a monotonically increasing sequence that converges to 10. Give an example (if T) or justify (if F).
   (f) T or F? There exists a monotonically increasing bounded sequence that does not converge (that is, diverges). Provide an example (if T) or justify (if F).
   (g) T or F? There is a non-monotonic sequence that converges to 4. Provide an example (if T) or justify (if F).

2. (Sec 11.1 proving convergence of a sequence)
   (a) Give *a* positive number N such that, $\dfrac{1}{n^2-5} < \frac{1}{7000}$ for all $n > N$.
   (b) I give you a positive number ϵ. Choose *a* positive number N such that, if $n > N$, then $\dfrac{1}{n^2-5} < \epsilon$.
   (c) The sequence
   $$\left\{\frac{7n-8}{8n+3}\right\}_{n=1}^{\infty}$$
   converges to $7/8$. For any number $\epsilon > 0$, find N so that $\left|\dfrac{7n-8}{8n+3} - \dfrac{7}{8}\right| < \epsilon$ as long as $n > N$.
   (d) The sequence $a_n = (2n+4)/(5n-8)$ converges to $2/5$. For any number $\epsilon > 0$, choose N so that if $n > N$, then $|2/5 - a_n| < \epsilon$.

3. (Sec 11.1 sequences)
   (a) Compute
   $$\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n.$$
   (Hints: Note the indeterminate form of type 1^∞. You can write $y = \left(1+\frac{1}{x}\right)^x$ and $ln(y) = x\left(1+\frac{1}{x}\right)$. See l'Hopital handout pages 4-5 and WebAssign Sec 11.1 no. 5.)
   (b) Compute
   $$\lim_{n\to\infty}\left(1+\frac{1}{2n}\right)^n \quad \text{and} \quad \lim_{n\to\infty}\left(1+\frac{5}{4n}\right)^n \quad \text{if they exist.}$$
   (c) Find the limit of the sequence
   $$\left\{\sqrt{5}, \sqrt{5\sqrt{5}}, \sqrt{5\sqrt{5\sqrt{5}}}, \dots\right\} \quad \text{(You can assume without explanation that it converges).}$$

4. (Sec 11.2 WebAssign homework)
   (a) Determine whether each series is convergent or divergent by expressing s_n as a telescoping sum.
   (i) $\displaystyle\sum_{n=1}^{\infty}\frac{5}{n(n+1)}$. For now, use the fact that: $\displaystyle\frac{1}{n(n+1)} = \frac{1}{n} - \frac{1}{n+1}$
   (ii) $\displaystyle\sum_{n=2}^{\infty}\frac{8}{n^2-1}$. For now, use the fact that: $\displaystyle\frac{2}{(n-1)(n+1)} = \frac{1}{n-1} - \frac{1}{n+1}$
   (b) T or F? If $\{a_n\}$ doesn't converge to 0, then the series of $\sum_{n=1}^{\infty} a_n$ diverges. If T, justify. If F, give a counterexample.
   (c) T or F? If $\lim_{n\to\infty} a_n = 0$, then the series $\sum_{n=1}^{\infty} a_n$ converges. If T, justify. If F, give a counterexample.
   (d) Determine whether the sequence $\left\{\dfrac{-1+n^2}{5n^2+100}\right\}_{n=1}^{\infty}$ Determine whether the series $\sum_{n=1}^{\infty}\dfrac{-1+n^2}{5n^2+100}$ is convergent or divergent.

5. Apply squeeze theorem to answer the following questions.
   (a) Determine whether
   $$\left\{\frac{1}{5\ n!\ 2^n}\right\} \text{ converges or diverges.}$$
   (Hint: squeeze this sequence between 0 and a geometric sequence. See also a related sequence on WebAssign Sec 11.1 no. 6).
   (b) Consider the sequence $\left\{\dfrac{\cos n}{\sqrt{n}}\right\}$ for $n \geq 1$. Use the squeeze theorem to show that this converges and find its limit. Hint: Find two sequences of the type $\dfrac{\text{(a constant)}}{\sqrt{n}}$ that bound $\dfrac{\cos n}{\sqrt{n}}$. You may assume that $\lim_{n\to\infty}\frac{\text{(a constant)}}{\sqrt{n}} = 0$.