1. Which of these functions is not uniformly continuous on \((0, 1)\)?
   
   (a) \(x^2\)
   
   (b) \(1/x^2\)
   
   (c) \(f(x) = 1\) for \(x \in (0, 1), f(0) = f(1) = 0\)
   
   (d) \(\sin(x)\)
   
   (e) \(\sin(x)/x\)

2. Let \(s_n\) be a sequence of real numbers on a bounded set \(S\), where \(\lim \inf s_n \neq \lim \sup s_n\). Which of the following is not necessarily true?

   (a) \(\lim s_n\) does not exist.
   
   (b) \(s_n\) is not Cauchy.
   
   (c) \(\lim \inf s_n < \lim \sup s_n\)
   
   (d) There exists a convergent subsequence.
   
   (e) \(s_n\) has an infinite number of dominant terms.

3. Which of the following is not true about \(s_n = 1/n\)?

   (a) The sequence converges to 0.
   
   (b) \(\lim_{n \to \infty} \sum_{i=1}^{n} s_i = L\), for some finite \(L\).
   
   (c) \(\lim \sup s_n = 0\).
   
   (d) The series \(\sum (-1)^n s_n\) converges.
   
   (e) The series \(\sum s_n^2\) converges.

4. Let \(\sum a_n\) be a conditionally convergent series. Which of the following is not necessarily true?

   (a) The series converges to some finite \(L\).
   
   (b) The series sum is independent of order of terms.
   
   (c) \(\sum |a_n|\) diverges.
   
   (d) \(\lim (-1)^n a_n = 0\).
   
   (e) None of the above. They’re all necessarily true.
5. Which of the following series converges? **THERE ARE TWO ANSWERS**

(a) \[ \sum \frac{x^n}{n!}, \forall x \]
(b) \[ \sum \frac{1}{n + \sin(n)} \]
(c) \[ \sum (-1)^n n \]
(d) \[ \sum \sin(n) \]
(e) \[ \sum \frac{2^n}{\sqrt{n!}} \]

6. Which of the following must be true of a continuous function on \((a, b)\)?

(a) The function achieves its maximum on \((a, b)\).
(b) The function is bounded.
(c) For all Cauchy Sequences \(s_n\) on the set \((a, b)\), \(f(s_n)\) is also Cauchy.
(d) If \(f(a) = 2\), and \(f(b) = 5\), then \(f(c) = 3\), for some \(c \in (a, b)\).
(e) None of the above.

7. Which of the following is not necessarily true about a uniformly continuous function, \(f\), on \([a, b]\)? **THERE ARE THREE ANSWERS**

(a) The function is bounded.
(b) The function achieves its maximum on the set \((a, b)\).
(c) If \(f(a) = 4\) and \(f(b) = 6\), then \(f'(c) = 2\) for some \(c \in (a, b)\).
(d) The derivative \(f'\) is bounded.
(e) If \(f'(a) = 3\), and \(f'(b) = 4\), then \(f'(c) = 3.5\) for some \(c \in (a, b)\).

8. Find \(\lim_{x \to b} \frac{\sqrt{x} - \sqrt{b}}{x - b}\) for \(b > 0\).

(a) \(\infty\)
(b) \(\frac{1}{2\sqrt{b}}\)
(c) \(0\)
(d) \(2\sqrt{b}\)
(e) \(b\)

9. Let \(f\) be a differentiable function, where all derivatives exist, such that \(f(0) = 0\), \(f'(0) = 0\), and \(|f''(x)| \leq M, \forall x\). Which of the following is not necessarily true?

(a) \(f(1) \leq \frac{M}{2}\)
(b) 0 is neither a maximum nor a minimum.
(c) \(\forall \epsilon > 0, \exists \delta > 0\) s.t. if \(x \in (-\delta, \delta)\), \(|f(x)| < \epsilon\)
(d) If \(\lim s_n = 0\), then \(\lim f(s_n) = 0\).
(e) None of the above.