1. Use the basic properties of convergent sequences and results regarding limits of common sequences to evaluate the limit, if it exists, of each of the following sequences \( \{a_i\} \). If a sequence is divergent, explain why.

(a) \( a_i = \frac{\sqrt{i}}{2 - \sqrt{i}} \)  
(b) \( a_i = \frac{i}{2 - \sqrt{i}} \)  
(c) \( a_i = 7 - \left( -\frac{1}{4} \right)^i \)  
(d) \( a_i = \frac{3 \cdot 7^i}{2^{3i-1}} \)  
(e) \( a_i = \frac{5^i + 1}{5^i - 1} \)  
(f) \( a_i = \frac{5^i + 1}{3^i - 2^i} \)

2. Use any appropriate method to evaluate the limit, if it exists, of each of the following sequences \( \{a_i\} \). If a sequence is divergent, explain why.

(a) \( a_i = 1 + \sin \left( \frac{i\pi}{2} \right) \)  
(b) \( a_i = \frac{i!}{(i + 2)!} \)  
(c) \( a_i = \frac{1}{i^2} + \frac{2}{i^2} + \cdots + \frac{i}{i^2} \)  
(d) \( a_i = \frac{\sin^2(i)}{5^i} \)  
(e) \( a_i = \frac{\ln(2 + e^i)}{9i} \)  
(f) \( a_i = \left( 1 + \frac{3}{i} \right)^i \)

3. Determine whether each of the following sequences \( \{a_i\} \) is increasing, decreasing or not monotonic. If it is not monotonic, is there a tail of the sequence which is increasing or decreasing? Finally, is \( \{a_i\} \) bounded?

(a) \( a_i = \frac{3i - 7}{4i + 1} \)  
(b) \( a_i = \cos \left( \frac{i\pi}{3} \right) \)  
(c) \( a_i = \frac{4\sqrt{i}}{i + 5} \)  
(d) \( a_i = \frac{1 \cdot 4 \cdot 7 \cdots (3i - 2)}{3 \cdot 6 \cdot 9 \cdots (3i)} \)