1. (3pts) Is the series
$$\sum_{n=2}^{\infty} \frac{(-1)^n}{n+\sqrt{n}}$$
convergent or divergent? Justify your answer.

   The sequence $\frac{1}{n+\sqrt{n}}$ is positive, decreasing, and converges to zero. Therefore the given series converges by the alternating series test.

2. (3pts) Use the **Comparison Test** or **Limit Comparison Test** to determine whether the series converges or diverges. Verify your answer.
$$\sum_{n=1}^{\infty} \frac{\sin(1+2^{-n})}{2^n}$$

   For all n, $0 < \sin(1+2^{-n}) \leq 1$. Then $0 < \frac{\sin(1+2^{-n})}{2^n} < \frac{1}{2^n}$. Therefore the given series converges by the comparison test.

3. (4pts) Determine whether the statement true or false. If false give a counterexample.

   (a) (2pts) The series $\sum_{n=1}^{\infty} a_n^2$ is divergent then $\sum_{n=1}^{\infty} a_n^3$ is divergent.

   False. Consider $a_n = \frac{1}{\sqrt{n}}$.

   (b) (2pts) The series $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$ are convergent then the series $\sum_{n=1}^{\infty} a_n + b_n$ is convergent.

   True.