Determine whether the following integrals are convergent or divergent. If convergent, determine their value.

1. \( \int_{1}^{\infty} \frac{1}{\sqrt{x}} \, dx \)

2. \( \int_{1}^{\infty} \frac{1}{x^{3/2}} \, dx \)

3. Look carefully at these two examples. What was it that made one convergent and the other divergent? Try to generalize from these two examples and make a conjecture (i.e. prediction based on some evidence). For what values of \( p > 0 \) will the integral \( \int_{1}^{\infty} \frac{1}{x^{p}} \, dx \) converge? If you need more evidence before making your conjecture, examine \( \int_{1}^{\infty} \frac{1}{x^{1/4}} \, dx \) and \( \int_{1}^{\infty} \frac{1}{x^{3}} \, dx \).