Please write your solutions on a separate sheet of paper. Be sure to write your name and section number at the top of each page.

**Problem 1.** (15 points)
(i) State the Squeeze Theorem.
(ii) Prove the Squeeze Theorem.
(iii) Use the Squeeze Theorem to find
\[
\lim_{x \to 0} \frac{x^4}{10} \cos \frac{2\pi}{5x}.
\]
Justify your answer carefully.

**Problem 2.** (30 points)
(i) State the definition of limit for sequences (i.e. what exactly does \( \lim_{n \to \infty} f(n) = L \) mean?).
(ii) Prove that
\[
\lim_{n \to \infty} \left( \frac{3}{4} \right)^n = 0.
\]
(iii) Prove that
\[
\lim_{n \to \infty} \frac{n^3 - 1}{n^3} = 1.
\]

**Problem 3.** (35 points)
(i) State the definition of limit for functions (i.e. what exactly does \( \lim_{x \to a} f(x) = L \) mean?).
(ii) Let \( f(x) = \sqrt{x - 3} \). Find a real number \( \delta \) such that the following is true:
\[
\text{if } x \text{ is a real number such that } 0 < |x - 7| < \delta, \text{ then } |f(x) - 2| < \frac{1}{3}.
\]
(iii) Prove that
\[
\lim_{x \to 0} x^{43} = 0.
\]
(iv) Prove that
\[
\lim_{x \to 3} x^2 - 4x = -3.
\]

**Problem 4.** (10 points) Evaluate the following limits and justify each step by indicating the appropriate Limit Laws.
(i)
\[
\lim_{x \to -2} \left( \frac{t^2 - 2}{2t^2 - 3t + 2} \right)^3
\]
(ii)
\[
\lim_{x \to 2} \sqrt{\frac{2x^2 + 1}{3x - 2}}
\]

**Problem 5.** (10 points)
(i) What exactly does it mean for a function \( f(x) \) to be continuous at the point \( x = a \)?
(ii) State the Intermediate Value Theorem.
(iii) Use it to show that the polynomial \( p(x) = x^2 - \pi x + 2 \) has a root between 0 and 1.