

1. For each of the flowing Universally Quantified Implications, do the following:
  - Express it in the form  $\forall x \in \mathbb{R} : \text{if } \_ \text{ then } \_$ .
  - Prove or disprove it.
  - Repeat all that with its converse.
  - (a) If  $x > 100$  then  $\frac{100}{3-2x} > -1$ .
  - (b) If  $\frac{3}{x^2-1} < \frac{1}{100}$  then  $x \geq 20$ .
  - (c)  $x > 10$  when  $\frac{x^5-2}{3x^2+7} < 100$ .
  - (d)  $\frac{x^4+x^3+x+1}{x^2} > 200000$  implies that  $x > 100$ .
2. One leg of a right triangle exceeds the other leg by 4 cm. The hypotenuse is 20 cm.
  - (a) Denote  $x$  the length of the shorter leg. Write down the equation satisfied by the sides of the triangle.
  - (b) Find the value of  $x$ . Write the solution of the equation step by step following the process you learned in class.