

Full Name:
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1. Determine which of the following statements are true or false. Write T/F in the blank accordingly.  
No explanation is necessary.

(a) \_\_\_\_\_  $\{2, 4, 7\} \subset \{1, 2, 4, 6, 7, 9\}$

1
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(b) \_\_\_\_\_  $\frac{\sqrt{12}}{\sqrt{3}} \in \mathbb{Q}$

1
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(c) \_\_\_\_\_  $\{-15, \frac{3}{4}, \pi\} \subset \mathbb{R}$

1
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2. Write the inverse and contrapositive of the following statement:

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*“If  $1 + 1 = 3$ , then I am the Pope.”*

3. Suppose  $x$  is a real number. Prove that if  $x^2$  is irrational, then  $x$  is irrational.

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4. Prove by induction that the following identity holds for all natural numbers  $n$ .

8
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$$1^3 + 2^3 + 3^3 + 4^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4}$$