Math 365
Section 6.4

Problem 1
Prove \( \sqrt{5} \) is irrational.

Problem 2
Prove the sum of a rational number and an irrational number is an irrational number.

Problem 3
Prove the product of any rational number and any irrational number is an irrational number.

Problem 4
Determine which of the following represent irrational numbers:

a) \( \sqrt{51} \)  
b) \( \sqrt{64} \)  
c) \( \sqrt{324} \)  
d) \( \sqrt{325} \)  
e) \( \sqrt{2} - \frac{2}{\sqrt{2}} \)  
f) \( \sqrt{8} / \sqrt{2} \)  
g) \( 1/1 + \sqrt{2} \)  
h) \( 4/\sqrt{2} - \sqrt{2} \)  
i) \( (\sqrt{2})^{-4} \)

Problem 5
Find an irrational number between 0.53 and 0.54.
Problem 6

Without using a calculator or doing any computation, determine if $\sqrt[3]{3} = 3.605$. Explain why or why not.

Problem 7

Pi ($\pi$) is an irrational number. Could $\pi = \frac{22}{7}$? Why or why not?

Problem 8

If $R$ is the set of real numbers, $Q$ is the set of rational numbers, $I$ is the set of integers, $S$ is the set of irrational numbers, and $N$ is the set of natural numbers, complete the following table by placing checkmarks in the appropriate columns.

<table>
<thead>
<tr>
<th></th>
<th>$R$</th>
<th>$Q$</th>
<th>$I$</th>
<th>$S$</th>
<th>$N$</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>2.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>$-7$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>$\sqrt{6}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e)</td>
<td>$\frac{1}{3}$</td>
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</tr>
</tbody>
</table>

Problem 9

Write each of the following in simplest form.

a) $\sqrt[3]{363}$

b) $\sqrt[3]{96}$

c) $\sqrt[3]{-320}$

d) $\sqrt[11]{\frac{729a^6}{b^{11}}}$

Problem 10

Find the missing terms of the following geometric sequence:

5, ____, ____ , 10