3.1 Irrational Numbers

Friday, March 10, 2023 1:59 PM

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Natural Numbers (strictly positive):	1, 2, 3, 4 ....
Whole Numbers:	0, 1, 2, 3, 4, ...
Integers:	...-3, -2, -1, 0, 1, 2, 3, ...
Rational Numbers:	1) Can be written in fraction form $\frac{m}{n}$, $n \neq 0$, where m and n are whole numbers. 2) As radicals, they do have exact roots. 3) When converted to decimal form, they either terminate (end) or repeat (pattern). $\frac{2}{3}$ $-\frac{1}{5}$ 0.7 -3 $\sqrt{4}$
Irrational Numbers :	1) As radicals, they do not have exact roots. 2) When converted to decimal form, they are non-repeating. Therefore, they cannot be written as fractions. $\sqrt{5}$ $\sqrt{23}$ $\sqrt{3}$

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$\sqrt{9}$ $\sqrt{16}$ $\sqrt{64}$

Example 1: Classify the following numbers as rational or irrational

4 a) $\sqrt{16}$ Rational

b) $\frac{-3}{5} = -0.6$ Rational

c) $\sqrt[3]{32}$ Irrational

d) 0.1818... Rational $\frac{18}{99}$

e) $\sqrt{\frac{4}{9}} = \frac{\sqrt{4}}{\sqrt{9}} = \frac{2}{3} = 0.\overline{6}$ (R)

f) 1.276 $= \frac{1276}{1000}$ Rational

Y

g) $\sqrt[3]{0.12}$ Irrational

h) $\frac{\pi}{2}$ Irrational

$\sqrt{0.25} = \sqrt{\frac{1}{4}} = \frac{\sqrt{1}}{\sqrt{4}} = \frac{1}{2}$

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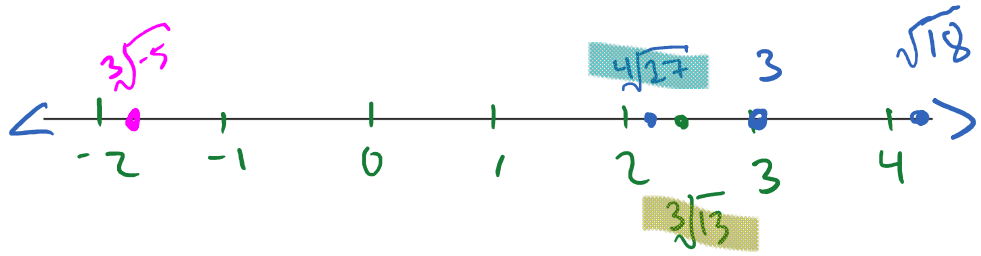
i) $\sqrt{\frac{18}{5}}$ Irrational

j) $-\sqrt{0.25} = -\frac{1}{2} = -0.5$ (R)

Example 2: Order the following rational and irrational numbers on a number line.

$\sqrt[3]{13}$ $\sqrt{18}$ $\sqrt{9}$ $\sqrt[4]{27}$ $\sqrt[3]{-5}$

2.351 4.243 3 2.28 -1.71



Write the above radicals in order of least to greatest.

$\sqrt[3]{-5}, \sqrt[4]{27}, \sqrt[3]{13}, \sqrt{9}, \sqrt{18}$

Example 3: Why are $\sqrt[3]{27}$ and $\sqrt{64}$ rational numbers but $\sqrt[3]{13}$ and $\sqrt{8}$ are irrational numbers?

$\sqrt[3]{27} = 3$ → perfect cube

$\sqrt{64} = 8$ → perfect square

} Rational

$\sqrt[3]{13} \approx 2.3513\ldots$

$\sqrt{8} \approx 2.828427\ldots$

not perfect

} Irrational.

Practice: p. 211 #3 – 5, 9a, 10a, 11, 15, 18ab