

MATHEMATICS 201-009-50

Precalculus

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I – Exponents and Radicals

1. Express the inequality in interval notation and graph the corresponding interval.

a) $x \leq 3$ b) $-2 < x \leq -1$ c) $x > 4$ d) $1 < x < 3$

2. Express the intervals in terms of an inequality and sketch their.

a) $[-2, 2]$ b) $[-2, -1)$ c) $(-2, \infty)$ d) $(-\infty, 2]$

3. Graph the set.

a) $(-3, -1) \cup (-2, 4)$ b) $(-3, -1) \cap (-2, 4)$ c) $(-\infty, 4) \cap [2, 5]$

4. Evaluate the number (without the use of a calculator).

a) $(-3)^4$ b) $(\frac{1}{3})^{-2}$ c) $\sqrt[5]{\frac{1}{32}}$ d) $\sqrt[3]{-64}$
e) $81^{\frac{3}{4}}$ f) $64^{\frac{7}{6}}$ g) $(-16)^{\frac{5}{4}}$ h) $(\frac{8}{27})^{\frac{-2}{3}}$
i) $\sqrt{5}\sqrt{20}$ j) $\frac{\sqrt{75}}{\sqrt{3}}$ k) $\sqrt[4]{24}\sqrt[4]{54}$ l) $(-2\sqrt{2})^{\frac{3}{5}}$

5. Simplify the following expressions.

a) x^2x^{-5} b) $(2t^{-3})(3t^8)$ c) $(2x^2)^4(3x^{-3})^2$
d) $\frac{2x^3x^{-2}}{4x^4}$ e) $(x^2y^3)^2(x^{-2}y)^{-3}$ f) $\frac{x^2y^{-3}z^2}{xy^2z^{-1}}$
g) $\frac{(2x^2y)^{-2}(3x^{-1})^3}{(4x^{-3}y^2)^{-3}}$ h) $\left(\frac{3a^2b^3c^{-2}}{a^2b^{-1}c}\right)^{-2}$ i) $\frac{p^{-3}q^{-2}r^5}{q^2r^{-3}s^4}$
j) $\left(\frac{2x^2y^{-1}}{3z^2}\right)^{-2}\left(\frac{3xz^2}{y}\right)^3$ k) $t^{\frac{2}{3}}t^{\frac{-1}{5}}$ l) $(9x^5)^{\frac{1}{2}}(8x^7)^{\frac{2}{3}}$
m) $(x^{\frac{3}{4}})^{\frac{2}{5}}$ n) $(3x^{\frac{-2}{3}}y^{\frac{1}{2}})^3(2x^{\frac{1}{2}}y^{\frac{3}{4}})^2$ o) $(8x^{-2}y^{\frac{3}{4}})^{\frac{-1}{3}}(5x^{-\frac{1}{3}})^2$
p) $\frac{4x^{\frac{-3}{4}}y^{\frac{1}{2}}z^{\frac{2}{5}}}{x^2y^{-3}z^{\frac{2}{3}}}$ q) $\left(\frac{9x^{\frac{1}{2}}y^{\frac{3}{5}}}{x^{\frac{-2}{3}}y^2}\right)^{\frac{-5}{2}}$ r) $(4x^{-3}y^2)^{\frac{-1}{6}}\left(\frac{3x^2y^{\frac{-1}{2}}}{x^{\frac{1}{2}}y^{\frac{1}{3}}}\right)^{-2}$
s) $\sqrt{72}$ t) $\sqrt[3]{16} + \sqrt[3]{250}$ u) $\sqrt[3]{x^6y^2}$
v) $\sqrt[4]{x^5y^2}\sqrt[4]{x^6y^3}$ w) $\sqrt[3]{\sqrt{64x^3}}$ x) $\sqrt[4]{t^{3n+1}}\sqrt[4]{t^{n-1}}$

y) $x^{2m-1}x^{3-2n}x^{\frac{m}{2}+n}$

z) $\frac{(2x^3)^{n+1}}{4x^3}$

aa) $\sqrt{x\sqrt{x\sqrt{x\sqrt{x}}}}$

6. Write each number in scientific notation.

a) 0.000431

b) 9 664 723

c) 32.456

d) 5

7. Write each number in ordinary decimal notation.

a) 3.21×10^{-3}

b) 1.55×10^7

c) 9.81435×10^3

8. Simplify the following and express your answer in scientific notation.

a) $(1.3 \times 10^{-3})(4 \times 10^7)$

b) $\frac{1.56 \times 10^{-4}}{1.2 \times 10^7}$

c) $\frac{(0.00000244)(30000)}{12.2}$

d) $\frac{(4 \times 10^{-7})^3(3 \times 10^5)}{3.2 \times 10^3}$

e) $\frac{(10.01)(1.2 \times 10^{-3})^2}{7.2 \times 10^{-4}}$

9. Rationalize the denominator.

a) $\frac{1}{\sqrt{7}}$

b) $\frac{3\sqrt{2}}{\sqrt{5}}$

c) $\sqrt{\frac{3x}{2}}$

d) $\frac{2}{3-\sqrt{5}}$

e) $\frac{3+2\sqrt{5}}{3-2\sqrt{5}}$

f) $\frac{4}{1+\sqrt{x}}$

g) $\frac{3}{2-3\sqrt{x}}$

h) $\frac{3}{\sqrt{2}-\sqrt{5}}$

i) $\frac{1}{\sqrt{a}-\sqrt{b}}$

10. Are the following statements True or False for all $x \in \mathbb{R}$?

a) $\sqrt[4]{x^4} = x$

b) $\sqrt[5]{x^5} = x$

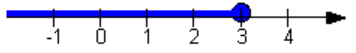

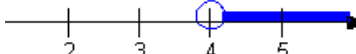

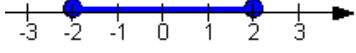

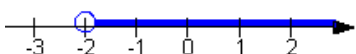

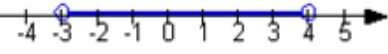


c) $\sqrt{x^4} = x^2$

d) $(x^2)^5 = x^7$

e) $3^{2x}3^{4x} = 9^{6x}$

f) $\sqrt[3]{x^3+8} = x+2$

ANSWERS

1. a) $(-\infty, 3]$  b) $(-2, -1]$ 
- c) $(4, \infty)$  d) $(1, 3)$ 
2. a) $-2 \leq x \leq 2$  b) $-2 \leq x < -1$ 
- c) $-2 < x < \infty$  $-\infty < x \leq 2$ 
3. a)  b) 
- c) 
4. a) 81 b) 9 c) $\frac{1}{2}$ d) -4 e) 27 f) 128 g) \cancel{A}
 h) $\frac{9}{4}$ i) 10 j) 5 k) 6 l) 2
5. a) $\frac{1}{x^3}$ b) $6t^5$ c) $144x^2$ d) $\frac{1}{2x^3}$ e) $x^{10}y^3$ f) $\frac{xz^3}{y^5}$ g) $\frac{432y^4}{x^{16}}$
 h) $\frac{c^6}{9b^8}$ i) $\frac{r^8}{p^3q^4s^4}$ j) $\frac{243z^{10}}{4xy}$ k) $t^{\frac{7}{15}}$ l) $12x^{\frac{43}{6}}$ m) $x^{\frac{3}{10}}$ n) $\frac{108y^3}{x}$
 o) $\frac{25}{2y^{\frac{1}{4}}}$ p) $\frac{4y^{\frac{7}{2}}}{x^{\frac{11}{4}}z^{\frac{1}{15}}}$ q) $\frac{y^{\frac{7}{2}}}{243x^{\frac{35}{12}}}$ r) $\frac{y^{\frac{4}{3}}}{9\sqrt[3]{2x^{\frac{9}{2}}}}$ s) $6\sqrt{2}$ t) $7\sqrt[3]{2}$ u) $x^2y^{\frac{2}{3}}$
 v) $x^{\frac{11}{4}}y^{\frac{5}{4}}$ w) $2\sqrt{x}$ x) t^n y) $x^{\frac{5}{2}m-n+2}$ z) $2^{n-1}x^{3n}$ aa) $x^{\frac{15}{16}}$
6. a) 4.31×10^{-4} b) 9.664723×10^6 c) 3.2456×10^1 d) 5×10^0
7. a) 0.00321 b) 15 500 000 c) 9814.35
8. a) 5.2×10^4 b) 1.3×10^{-11} c) 6×10^{-3} d) 6×10^{-18} e) 2.002×10^{-2}
9. a) $\frac{\sqrt{7}}{7}$ b) $\frac{3\sqrt{10}}{5}$ c) $\frac{1}{2}\sqrt{6}\sqrt{x}$ d) $\frac{3}{2} + \frac{\sqrt{5}}{2}$ e) $\frac{-29}{11} - \frac{12}{11}\sqrt{5}$
 f) $\frac{4-4\sqrt{x}}{1-x}$ g) $\frac{6+9\sqrt{x}}{4-9x}$ h) $-\sqrt{2} - \sqrt{5}$ i) $\frac{\sqrt{a}+\sqrt{b}}{a-b}$
10. a) F b) T c) T d) F e) F f) F