

Homework 3
due Thursday, February 7

1. Simplify

(a)

$$\frac{\left(\sqrt[5]{a^4}\right)^{\frac{1}{2}}}{\left(\sqrt[5]{a^4}\right)^3} \cdot \frac{\left(\sqrt{a\sqrt[3]{a^2}}\right)^4}{\left(\sqrt[4]{a}\right)^6}$$

(b)

$$\left(\frac{a\sqrt{a} + b\sqrt{b}}{\sqrt{a} + \sqrt{b}} - \sqrt{ab}\right) \left(\frac{\sqrt{a} + \sqrt{b}}{a - b}\right)^2$$

2. Solve for x . (Hint: In each equation make a substitution first.)

(a)

$$\frac{4}{x^2 + 4} + \frac{5}{x^2 + 5} = 2$$

(b)

$$\frac{x^2 + 1}{x} + \frac{x}{x^2 + 1} = 5.2$$

Solve the inequalities.

3.

$$\frac{(x - 1)(x + 5)^2}{x^2 + x - 12} < 0$$

4.

$$\frac{|x|^3(x + 2)^2}{(x - 3)^5(x + 1)} \leq 0$$

5.

$$(x^2 - 5x + 4) \left(1 + \sqrt{x(x - 1)(x + 5)}\right) > 0$$

6.

$$\begin{cases} 3x^2 - 4x + 1 > 0 \\ 2x^2 - 3x - 9 \leq 0 \end{cases}$$

7.

$$\frac{1}{x} < 2x + 1 < \frac{3}{x}$$

8.

$$\left(2x + \frac{1}{x}\right)^2 + 2x + \frac{1}{x} - 12 < 0$$

9. A cyclist covered first 18 kilometers of his trip at some constant velocity, and the remaining 6 kilometers at a velocity by 6 km/h lower than his initial velocity. Find the velocity of the cyclist on the second part of the trip if the whole trip took him 1.5 hours.