

Homework 2
due Thursday, Jan 31

1. Simplify

(a)

$$\left(\frac{1}{\sqrt{y}} - \frac{2}{\sqrt{x} + \sqrt{y}}\right) \left(\sqrt{x} - \frac{x}{\sqrt{x} - \sqrt{y}}\right)$$

(b)

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

2. Solve for x

(a)

$$\frac{x + 1}{x - 1} + \frac{3x + 2}{x + 1} = 4$$

(b)

$$\frac{2x + 3}{x + 4} + \frac{a}{x + 1} = 2$$

3. Find the ratio x/y given that

$$\frac{2x + 3y}{3x - 5y} = 1.$$

4. Shade the (x, y) points in the coordinate plane that satisfy the inequality

$$(x + y)^2 > (x - y)^2 + 4$$

5. Denote the roots of $f(x) = 3x^2 - 5x - 2$ by x_1 and x_2 . Find a polynomial whose roots are

(a) $x_1 + 1$ and $x_2 + 1$

(b) $3x_1$ and $3x_2$

6. Denote the roots of $f(x) = 5x^2 + 3x - 4$ by x_1 and x_2 . Find

(a) $\sqrt{\frac{1}{x_1} + \frac{1}{x_2}}$

(b) $x_1^2 + x_2^2$

(c) $\frac{x_1}{x_2} + \frac{x_2}{x_1}$

(d) $x_1^3 + x_2^3$

7. For which values of a does the quadratic equation

$$ax^2 + (a + 3)x - 1 = 0$$

have two distinct real roots?

8. It is known that two non-equal numbers b and c are the roots of $f(x) = x^2 + bx + c$. Find b and c .

9. Without solving the equation

$$f(x) = 13x^2 + 33x + 11 = 0$$

explain why it has two negative roots.

10. The polynomial $f(x) = ax^2 + bx + c$ has no roots and $a - b + c < 0$. Find the sign of a .
Bonus. It is given that $(a + b + c)c < 0$. Show that $b^2 - 4ac > 0$.