

Sample problem set #1

1. Simplify the expressions below. Do not use a calculator.

(a) $(7 - 3\sqrt{3})^2$ (b) $4\sqrt{24} - 2\sqrt{72}$

2. Rationalize the denominator:

(a) $\frac{5}{3\sqrt{2}}$ (b) $\frac{\sqrt{2}}{\sqrt{3} - 3\sqrt{2}}$

3. Simplify the expressions:

(a) $4x(3x^4 - 4x^3 + 6x^2 - 1) - 2x^2(x^2 - 4x + 3)$ (b) $\frac{3x}{x-4} + \frac{2x}{x+3}$

4. Factor the polynomials completely:

(a) $3x^2 - 2x - 8$ (b) $64 - 27x^3$

5. Use synthetic division to determine whether $x + 3$ is a factor of

$$-4x^3 + 5x^2 + 8$$

6. Solve the equations:

(a) $2(3 + 2x) = 3(x - 4)$ (b) $2x^2 - x - 3 = 0$ (c) $\sqrt{12 - x} = x$

7. Solve the inequalities, express your answer using set notation or interval notation:

(a) $|-x - 2| \geq 1$ (b) $x + 8 < \frac{1}{2}(x - 4)$

8. (a) Write an equation of a line that is perpendicular to the line $X = 2$ and passing through $(3, 4)$.

(b) Write the standard form of the equation of the circle $x^2 + y^2 + 4y - 12 = 0$.

Find the center and radius of the circle.

9. Find the domain of the functions (do not graph):

(a) $f(x) = \sqrt{16 - x^2}$ (b) $g(x) = \frac{x}{\sqrt{x - 3}}$

10. Sketch the graph of the function $f(x) = (x + 3)^2 - 5$, starting from the graph of the function $g(x) = x^2$.