

Algebra Review

Quadratic Formula

The roots of $ax^2 + bx + c = 0$ (if $a \neq 0$) are: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Example: The roots of $x^2 + 3x - 1 = 0$ are: $x = \frac{-3 \pm \sqrt{13}}{2}$

Special Factors

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

Examples:

- $(x^2 - 9) = (x + 3)(x - 3)$
- $(x^3 - 8) = (x - 2)(x^2 + 2x + 4)$
- $(x^3 - 4) = (x - \sqrt[3]{4})(x^2 + \sqrt[3]{4}x + \sqrt[3]{16})$

Exponents and Radicals

- $a^0 = 1, a \neq 0$
- $\frac{a^x}{a^y} = a^{x-y}$
- $\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$
- $\sqrt[n]{a^m} = a^{\frac{m}{n}} = (\sqrt[n]{a})^m$
- $a^{-x} = \frac{1}{a^x}$
- $(a^x)^y = a^{xy}$
- $\sqrt{a} = a^{1/2}$
- $\sqrt[n]{ab} = \sqrt[n]{a} \sqrt[n]{b}$
- $a^x a^y = a^{x+y}$
- $(ab)^x = a^x b^x$
- $\sqrt[n]{a} = a^{1/n}$
- $\sqrt[n]{\left(\frac{a}{b}\right)} = \frac{\sqrt[n]{a}}{\sqrt[n]{b}}$

Algebraic Errors to Avoid

Error 1

$$\frac{a}{x+b} \neq \frac{a}{x} + \frac{a}{b}$$

To see this error, let $a = b = x = 1$

Error 2

$$\sqrt{x^2 + a^2} \neq x + a$$

$$a - b(x - 1) \neq a - bx - b$$

To see this error, let $x = 3$ and $a = 4$. Remember to distribute the negative sign.

This should be: $a - b(x - 1) = a - bx + b$

Error 3

$$\frac{\left(\frac{x}{a}\right)}{b} \neq \frac{bx}{a}$$

To divide fractions, invert and multiply.

This should be:

$$\frac{\left(\frac{x}{a}\right)}{b} = \frac{\left(\frac{x}{a}\right)}{\frac{b}{1}} = \frac{x}{a} \cdot \frac{1}{b} = \frac{x}{ab}$$

Error 4

$$\sqrt{-x^2 + a^2} \neq -\sqrt{x^2 - a^2}$$

We can't factor a negative sign out of the square root.

Error 5

$$\frac{a + bx}{a} \neq 1 + bx$$

We can only cancel factors of the entire numerator with factors in the denominator.

This should be:

$$\frac{a + bx}{a} = \frac{a}{a} + \frac{bx}{a} = 1 + \frac{bx}{a}$$

Error 6

$$(x^2)^3 \neq x^5$$

The equation should be: $(x^2)^3 = x^2 x^2 x^2 = x^6$

For more information on algebra, make an appointment with a [content tutor](#). Appointments are available in person at the [Student Success Center](#) or online.

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