Common Algebraic Errors

Error	Reason/Correct/Justification/Example
$\frac{2}{0} \neq 0$ and $\frac{2}{0} \neq 2$	Division by zero is undefined!
$-3^2 \neq 9$	$-3^2 = -9$, $(-3)^2 = 9$ Watch parenthesis!
$(x^2)^3 \neq x^5$	$(x^2)^3 = x^2x^2x^2 = x^6$
$\frac{a}{b+c} \neq \frac{a}{b} + \frac{a}{c}$	$\frac{1}{2} = \frac{1}{1+1} \neq \frac{1}{1} + \frac{1}{1} = 2$
$\frac{1}{x^2+x^3} \neq x^{-2} + x^{-3}$	A more complex version of the previous error.
$\frac{\not{a} + bx}{\not{a}} \neq 1 + bx$	$\frac{a+bx}{a} = \frac{a}{a} + \frac{bx}{a} = 1 + \frac{bx}{a}$ Beware of incorrect canceling!
$-a(x-1) \neq -ax - a$	$-a(x-1) = -ax + a$ Make sure you distribute the "-"!
$(x+a)^2 \neq x^2 + a^2$	$(x+a)^2 = (x+a)(x+a) = x^2 + 2ax + a^2$

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Error	Explanation
$\sqrt{x^2+a^2} \neq x+a$	$5=\sqrt{25}=\sqrt{3^2+4^2} \neq \sqrt{3^2}+\sqrt{4^2}=3+4=7$
$\sqrt{x+a} \neq \sqrt{x}+\sqrt{a}$	See previous error.
$(x+a)^n \neq x^n+a^n$ and $\sqrt[n]{x+a} \neq \sqrt[n]{x}+\sqrt[n]{a}$	More general versions of previous three errors.
$2(x+1)^2 \neq (2x+2)^2$	$2(x+1)^2=2\left(x^2+2x+1\right)=2x^2+4x+2$ $(2x+2)^2=4x^2+8x+4$ Square first then distribute!
$(2x+2)^2 \neq 2(x+1)^2$	See the previous example. You can not factor out a constant if there is a power on the parenthesis!
$\sqrt{-x^2+a^2} \neq -\sqrt{x^2+a^2}$	$\sqrt{-x^2+a^2}=\left(-x^2+a^2\right)^{\frac{1}{2}}$ Now see the previous error.
$\dfrac{a}{\left(\frac{b}{c}\right)} \neq \dfrac{ab}{c}$	$\dfrac{a}{\left(\frac{b}{c}\right)}=\dfrac{\left(\frac{a}{1}\right)}{\left(\frac{b}{c}\right)}=\left(\frac{a}{1}\right)\left(\frac{c}{b}\right)=\dfrac{ac}{b}$
$\dfrac{\left(\frac{a}{b}\right)}{c} \neq \dfrac{ac}{b}$	$\dfrac{\left(\frac{a}{b}\right)}{c}=\dfrac{\left(\frac{a}{b}\right)}{\left(\frac{c}{1}\right)}=\left(\frac{a}{b}\right)\left(\frac{1}{c}\right)=\dfrac{a}{bc}$