

# Definitions and Rules for Exponents

Exponent of 1:  $a^1 = a$  *example:*  $7^1 = 7$

Exponent of 0:  $a^0 = 1, a \neq 0$  *example:*  $5^0 = 1$

Opposite sign exponents:  $a^{-n} = \frac{1}{a^n}, \frac{1}{a^{-n}} = a^n, a \neq 0$  *example:*  $8^{-2} = \frac{1}{8^2} = \frac{1}{64}$  and  $\frac{1}{8^{-2}} = 8^2 = 64$

Product rule:  $a^m \cdot a^n = a^{m+n}$  *example:*  $6^1 \cdot 6^2 = 6^{1+2} = 6^3$  or 216

Quotient rule:  $\frac{a^m}{a^n} = a^{m-n}, a \neq 0$  *example:*  $\frac{9^5}{9^2} = 9^{5-2} = 9^3$  or 729

Power rule:  $(a^m)^n = a^{mn}$  *example:*  $(4^2)^3 = 4^{2 \cdot 3} = 4^6$  or 4096

Product, raised to a power:  $(ab)^n = a^n b^n$  *example:*  $(2y)^3 = 2^3 y^3$  or  $8y^3$

Quotient, raised to a power:  $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}, b \neq 0$  *example:*  $\left(\frac{6}{7}\right)^2 = \frac{6^2}{7^2}$  or  $\frac{36}{49}$

Quotient, opposite sign power  $\left(\frac{a}{b}\right)^{-n} = \frac{b^n}{a^n}, b \neq 0, a \neq 0$  *example:*  $\left(\frac{6}{7}\right)^{-2} = \frac{7^2}{6^2}$  or  $\frac{49}{36}$