

# Fast Growth, Slow Growth: Using Integer Exponents

Video companion

## 1 Positive Integer Exponents

$$\begin{aligned}9 &= 3 \cdot 3 &&= 3^2 \\27 &= 3 \cdot 3 \cdot 3 &&= 3^3 \\81 &= 3 \cdot 3 \cdot 3 \cdot 3 &&= 3^4\end{aligned}$$

Exponents count how many times factors repeat in a number.  $3^4$  is pronounced “three to the fourth power” or “three to the fourth.”

### Example

$$248,832 = 12 \cdot 12 \cdot 12 \cdot 12 \cdot 12 = 12^5$$

**A note on pronunciation**  $4 \cdot 4 = 4^2$  can be pronounced “four to the second”—but also “four squared.” Similarly,  $4 \cdot 4 \cdot 4 = 4^3$  can be pronounced “four to the third”—but also “four cubed.”

## 2 Zero as an Exponent

$$\begin{aligned}1^0 &= 1 &&(2\pi)^0 = 1 \\2^0 &= 1 &&\left(\frac{1}{x^3}\right)^0 = 1 \\3^0 &= 1\end{aligned}$$

**Definition** By the definition of exponents, any number, except for zero, raised to the zeroth power is one. Note that  $0^0$  is undefined.

