Chapter 4: Exponential Functions

1. Algebra of exponents
2. Transformations
3. Applications

$$\left(\frac{(\cdot\ 3)^7(\ \cdot 3)^4}{(\cdot\ 3^4)^3}\right)^{-3}$$

$$= \left(\frac{3^{11}}{3^{12}}\right)^{-3}$$

$$= \left(3^{-1}\right)^{-3}$$

$$= 3^3 \Rightarrow 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$$

$$= 27 \checkmark$$

$$8^{\frac{2}{3}} - 81^{\frac{3}{4}} + 4^2 = ?$$

$$4 - 27 + 16 = -11$$

$$8^{\left(\frac{2}{3}\right)} = \sqrt[3]{8^2} \quad \text{or} \quad \left(\sqrt[3]{8}\right)^2$$

$$= 4$$

$$\sqrt[4]{\left(\frac{16}{81}\right)^{-1}}$$

$$= \sqrt[4]{\frac{81}{16}}$$

$$= \frac{3}{2}$$

$$\left(\frac{2}{3}\right)^2 = \frac{4}{9}$$

$$\sqrt[3]{\frac{(10x^3)^2}{(10x^6)^{-1}}}$$

$$\therefore \sqrt[3]{\frac{100\,x^6}{10^{-1}\,x^{-6}}}$$

$$= \sqrt[3]{1000\,x^{12/3}}$$

$$= 10x^4$$

$$f(x) = -3\left(\frac{1}{2}\right)^{\frac{1}{4}x-2} + 5 \longrightarrow \frac{1}{4}(x-8)$$

1. V. Str of -3
2. H. Str of 4
3. V. Sh of $+5$
4. H. Sh of $+8$

base $= \frac{1}{2}^{x}$

x	y
-3	8
-2	4
-1	2
0	1
1	$\frac{1}{2} = 0.5$
2	$\frac{1}{4} = 0.25$
3	$\frac{1}{8} = 0.125$

$\frac{1}{4}x+8$	$-3y+5$
-4	-19
0	-7
4	-1
8	2
12	3.5
16	4.25
20	4.625

The population of a town is growing at an average rate of 5% per year. In 2000, its population was 15 000. What is the best estimate of the population in 2020 if the town continues to grow at this rate?

$$f(x) = 15000(1.05)^{x}$$

$$f(20) = 15000(1.05)^{20}$$

$$= 39,799.46$$

When will we reach 50,000?

2025, 50795

2024, 48376

$f(x) = ab^{x}$ → x ⇒ periods

b → growth/decay

↳ Final

a: initial

g: $b = 1 + r$

d: $b = 1 - r$