

8.5 Solving Exponential Equations

Exponent Laws

$$a^m \times a^n = a^{m+n}$$

$$(a^m)^n = a^{mn}$$

$$a^{-n} = \frac{1}{a^n}$$

$$a^m \div a^n = \frac{a^m}{a^n} = a^{m-n}$$

$$a^0 = 1$$

$$x^{\frac{m}{n}} = (\sqrt[n]{x})^m$$

If $b^x = b^y$, then $x = y$

1. Solve for x . Leave answer in both simplified exact form and decimal form (3 decimal places), if necessary.

a) $5^{x^2+2x} = 125$

b) $27^{2x} = 81^{x-3}$

c) $6(3^{4f-2}) - 4 = -2$

d) $4^x = 7$

e) $93 = 10(5)^{2x-3} - 7$

f) $4^{2x-1} = 3^{x+2}$

g) $3^{x+2} - 3^x = 64$

h) $5^{x+2} + 5^{x+1} = 150$

i) $10(3^{2x}) - 31(3^x) + 15 = 0$

j) $2^x - 2^{-x} = 4$

Exponential Growth/Decay

$$A(t) = A_0(b)^{\frac{t}{k}}$$

$A(t)$ = final amount

A_0 = original amount / initial value

b = growth/decay factor

n = # growth/decay period

t = the elapsed time

k = length of each growth/decay period

2. Malakai bought a car in 2010 for \$29,000 and every year the value of car depreciates about 15%.
- Use an equation to model the relation between the value of the car over t years.
 - In which year will the car be worth about \$1000?

3. Lead-209 is a radioactive substance. Determine the half-life of lead-209 if only 4.6 mg of an original sample of 200 mg remains after 18 hours.