12-1 Exponential Functions

Objectives:

- I can simplify using properties of exponents
- I can solve an exponential function

Exponent Rules

$$x^a \bullet x^b = x^{a+b} \qquad \sqrt[a]{x^b} = x^{\frac{b}{a}}$$

$$\frac{x^a}{x^b} = x^{a-b} \qquad \frac{x^{-a}}{x^{-b}} = \frac{x^b}{x^a}$$

Simplify or re-write the following

$x^2 \bullet x^4$ $\qquad \dfrac{x^7}{x^3}$

$\sqrt[5]{x^2}$ $\qquad \sqrt[8]{x^4}$

$8^{\frac{2}{3}}$ $\qquad \dfrac{a^3 b^{-2}}{b^3 a^{-4}}$

$e^3 \bullet e^x$ $\qquad e^{\ln x - 4}$

EXPONENTIAL FUNCTION

$$f(x) = a(b)^x$$

Exponent

Initial Value (y-intercept)

Base (Multiplier)

Exponential Growth and Decay

When b>1, the function represents **exponential growth**

When 0<b<1, the function represents **exponential decay**

$$f(x) = a(1 \pm r)^t$$

The population of Orem is 300,000 and increasing at the rate of 2.49% each year.

What will the population be in 10 years?

On federal income tax returns, self employed people can depreciate the value of business equipment. Suppose a computer valued at $2765 depreciates at a rate of 30% per year.

How much will this computer be worth in 5 years?

Compound Interest Formula

P is the principal

r is the annual interest rate

n is the number of compounding periods per year

t is the time in years

$$A(t) = P\left(1 + \frac{r}{n}\right)^{nt}$$

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You invest \$1000 at 8% compounded quarterly.
How much will be in the account after 15 years

How long will it take to double your money if interest is earned at the rate of 3.99% compounded annually?

Continuous Compounding Formula

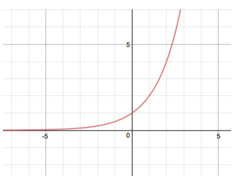
If P dollars are invested at an interest rate r, that is compounded continuously, then the amount, A, of the investment at time t is given by

$$A(t) = Pe^{rt}$$

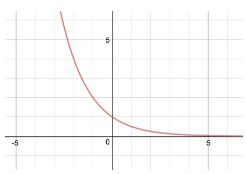
A person invests \$1550 in an account that earns 4% annual interest compounded continuously.
How much money will be in the account about 8 years?

Exponential Parent Function

Growth

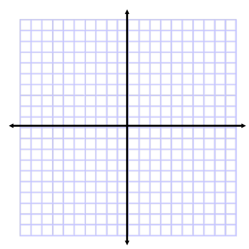


Decay



Graph each function and find the attributes listed.

$g(x) = 4\left(2^{x+2}\right) - 6$



Domain:

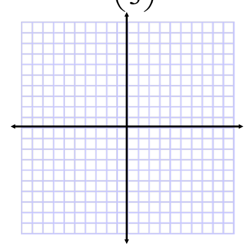
Range:

y-int:

HA:

End Behavior:

$f(x) = 3\left(\dfrac{1}{3}\right)^{x+2} - 4$



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