Section 4.2: Exponential Functions

Video 1

An exponential function is a function of the form $f(x)=a^x$ where $a>0$ and $a\neq 1$.

1) Let $f(x)=3^x$. Find the following.

a) $f(4)$

b) $f(1)$

c) $f(0)$

d) $f(-2)$

e) $f\left(\frac{3}{2}\right)$

f) $f(1.78)$

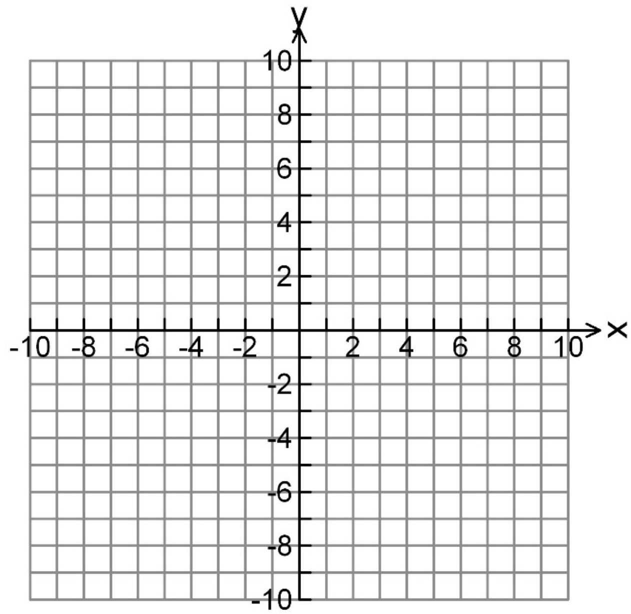
The graph of an exponential function $f(x)=a^x$ is increasing over its entire domain $(-\infty,\infty)$.

The range of the function is $(0,\infty)$.

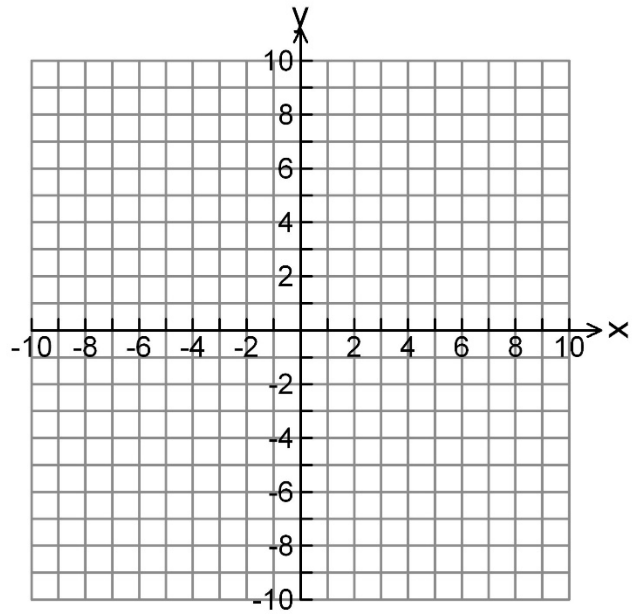
It has a horizontal asymptote on the *x*-axis $(y=0)$.

It passes through the points $\left(-1,\frac{1}{a}\right)$, $(0,1)$, and $(1,a)$.

2) Graph $f(x) = 3^x$.



3) Graph $f\left(x\right)=2^{x-3}-2$.



Video 2

4) Solve.

a) $4^x = \frac{1}{64}$

b) $5^x = 625$

Solve.

c) $3^{2x-3} = 9^{3x+1}$

d) $4^{x+5} = 8^{2x-1}$

Video 3

Solve.

e) $x^{2/3} = 36$

f) $x^{3/2} - 1 = 26$

Video 4

Compound Interest Formula

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

A: Balance after *t* years

P: Principal

r: Annual interest rate (percentage expressed as a decimal)

n: Number of times interest is compounded per year

t: Time, in t=years

5) If $5000 is invested at 3% interest, compounded monthly, what will the balance be after 10 years?

Video 5

6) How much needs to be invested at 6% annual interest, compounded quarterly, to reach a balance of $1000 in 5 years?

Video 6

7) What interest rate is needed to double the principal of $3000 in 4 years if compounding is annually?

Video 7

The number $e \approx 2.71828$ is often called the *natural base* or *Euler's number*.

e is the limit of the expression $\left(1+\frac{1}{n}\right)^n$ as $n \to \infty$.

This number appears over and over again in STEM fields.

Formula for Continuous Compounding

$$A = P \cdot e^{r \cdot t}$$

A: Balance after *t* years

P: Principal

r: Annual interest rate (percentage expressed as a decimal)

t: Time, in t=years

8) If $5000 is deposited in an account paying 9% interest compounded continuously for 30 years, find the balance.