



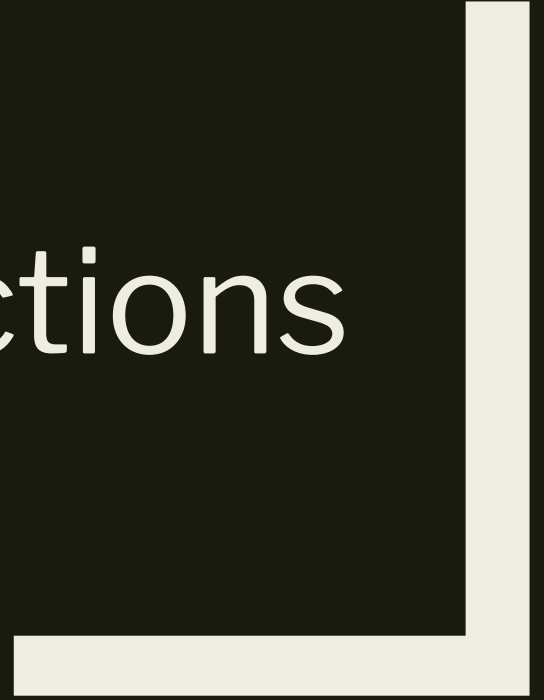
Exam 2 Review  
Session



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# Polynomial Functions



# Terms to Know

Degree: The highest exponent of the variable in a polynomial equation

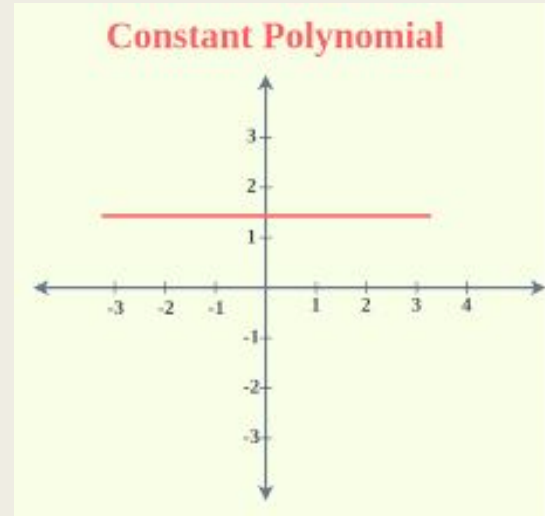
Leading Coefficient: The number in front of the variable with the highest exponent

Constant Term: a number that does not carry any variables

$$f(x) = 5 + 3x^7 - 2x^6 + 2x^3$$

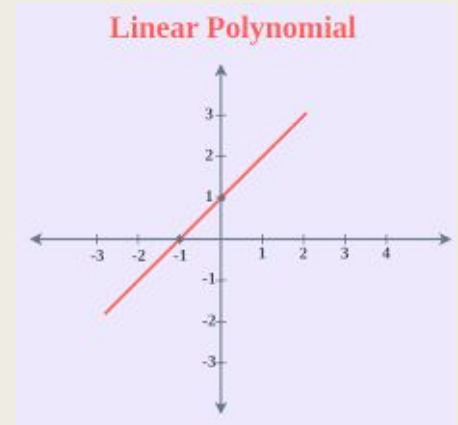
# Constant Polynomial Function

- Degree = 0
- Horizontal line indicates that the output of the function is constant, no matter the output



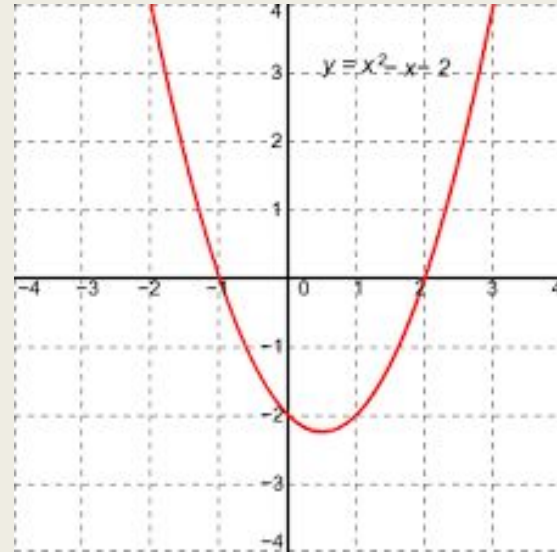
# Linear Polynomial Function

- Degree = 1
- Linear functions have one dependent variable and one independent variable.
- $F(x) = mx + c$
- $c = y$ -intercept



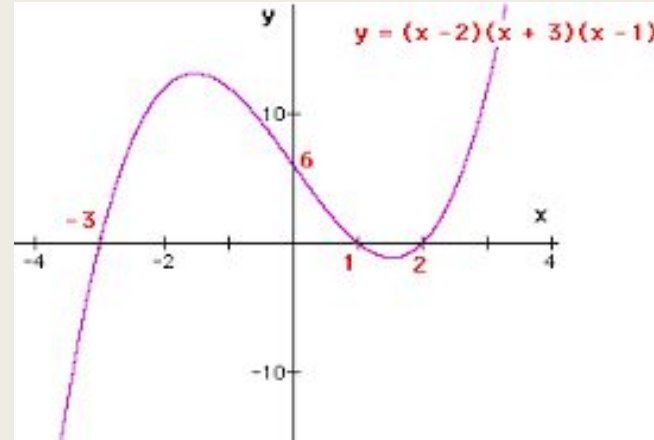
# Quadratic Polynomial Function

- Degree = 2
- A parabola is a curve with one extreme point called the vertex
- $F(x) = ax^2 + bx + c$



# Cubic Polynomial Function

- Degree = 3
- follows the equation  $ax^3+bx^2+cx+d$



# Rational Zero Theorem



A rational root of a polynomial function

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$$

is of the form:

$$\frac{p}{q} = \frac{\text{a factor of last term } (a_0)}{\text{a factor of first term } (a_n)}$$

Note:  $a_n, a_{n-1}, \dots, a_2, a_1, a_0$  are integers.

# Long Division of Polynomials



**Divisor**  $2x + 6$        $3x - 4$  ← **Quotient**

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$6x^2 + 10x - 24$  ← **Dividend**

$- 6x^2 - 18x$

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$- 8x - 24$

$+ 8x + 24$

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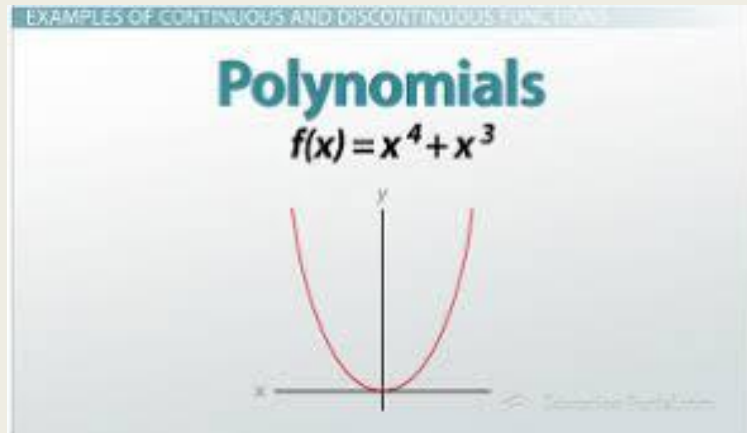
$0$  ← **Remainder**

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# Continuity

Remember: all polynomials are continuous!

- Domain is set to all real values



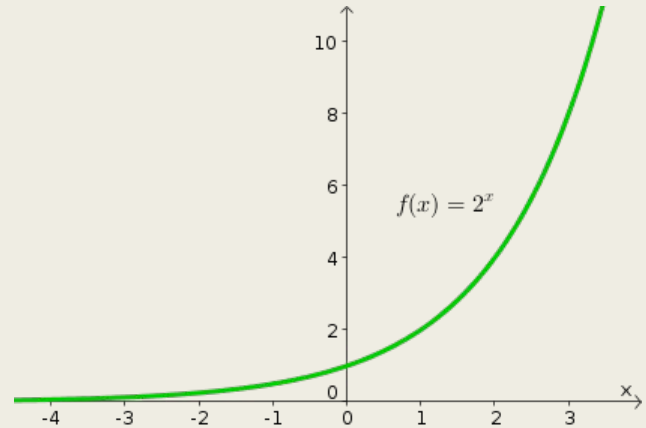
# Exponential Functions



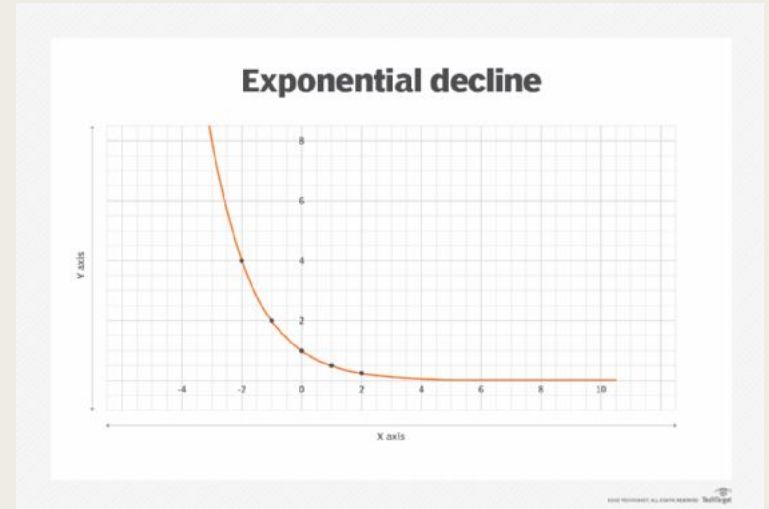
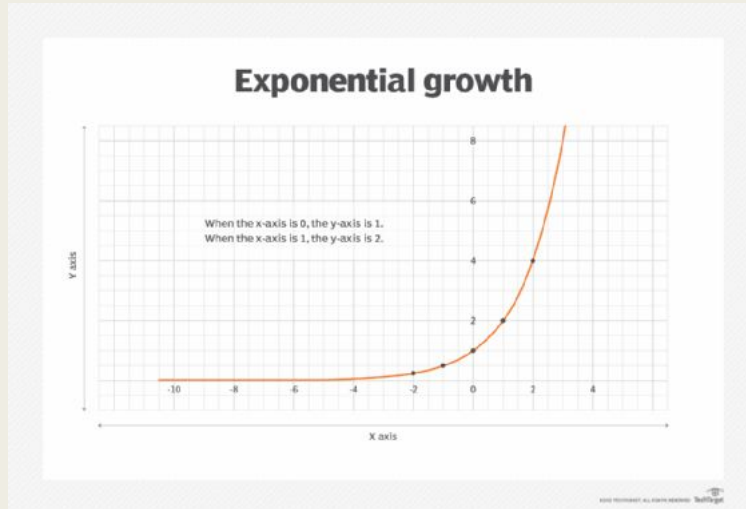
# What is an exponential function?

-A mathematical function used to calculate the exponential growth or decay of a given set of data .

-Can be used to calculate changes in population, loan interest charges, bacterial growth, radioactive decay or the spread of disease



# The Limits of Exponential Functions



if base (a) > 0:

As  $\lim \rightarrow \infty f(x) = \infty$

As  $\lim \rightarrow -\infty f(x) = 0$

if  $0 < \text{base}(a) < 1$ :

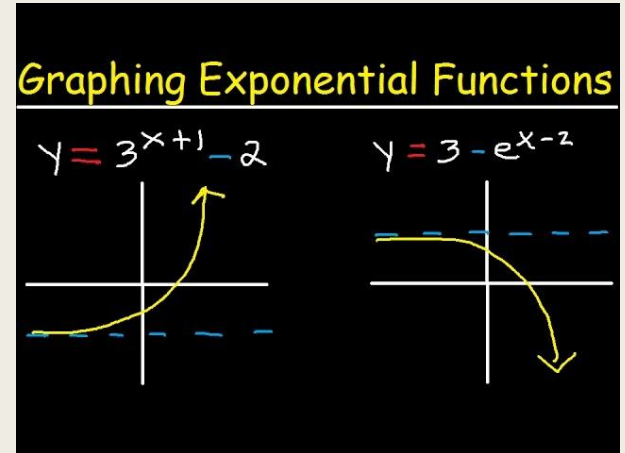
As  $\lim \rightarrow \infty f(x) = 0$

As  $\lim \rightarrow -\infty f(x) = \infty$

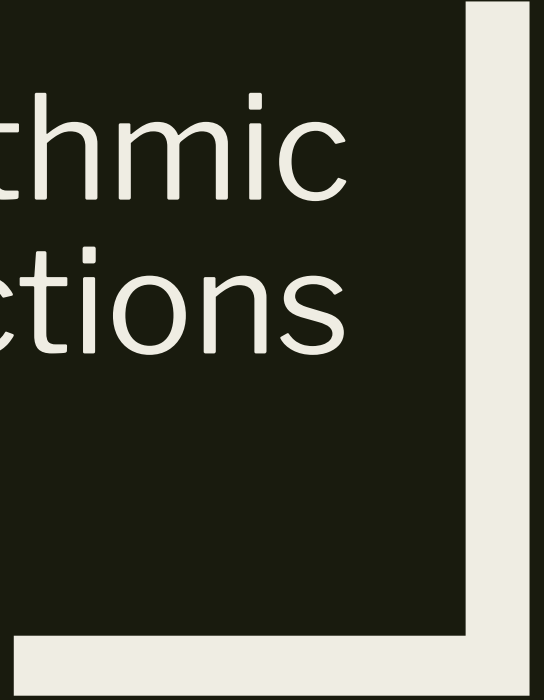
# Exponential Graph Transformation

In order to solve transformation problems:

- 1) Find the parent function (Determine if it starts with Exponential Decay or Growth)
- 2) Start with transformations closest to x
- 3) Draw the horizontal asymptotes



# Inverse & Logarithmic Functions



# What is a one-to-one function?

-A one-to-one function is the mapping of two sets. A function  $g$  is one-to-one if every element of the range of  $g$  corresponds to exactly one element of a domain  $g$ .

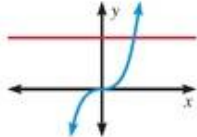
**Horizontal Line Test:** If the horizontal line intersects the graph of a function in all places at exactly one point, then the given function has an inverse that is also a function. We say thus function passes the horizontal line test.

**KEY CONCEPT** *For Your Notebook*

**Horizontal Line Test**

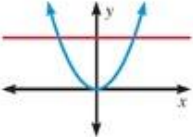
The inverse of a function  $f$  is also a function if and only if no horizontal line intersects the graph of  $f$  more than once.

**Inverse is a function**



A Cartesian coordinate system with x and y axes. A blue curve passes the horizontal line test. A horizontal red line intersects the curve at exactly one point. The curve is strictly increasing.

**Inverse is not a function**



A Cartesian coordinate system with x and y axes. A blue parabola opening upwards fails the horizontal line test. A horizontal red line intersects the parabola at two points.

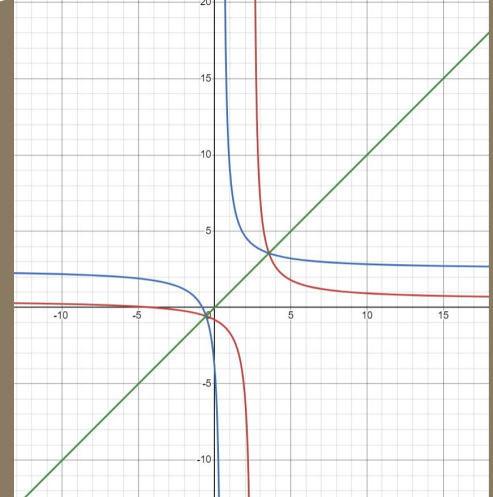
# How to find the inverse of a function?

**Step 1: Evaluate the function, change  $f(x)$  to  $y$  if necessary**

**Step 2: Swap the  $x$  and  $y$  variables**

**Step 3: Solve for  $y$**

**Step 4: Check for domain (in both the inverse and original function!!)**

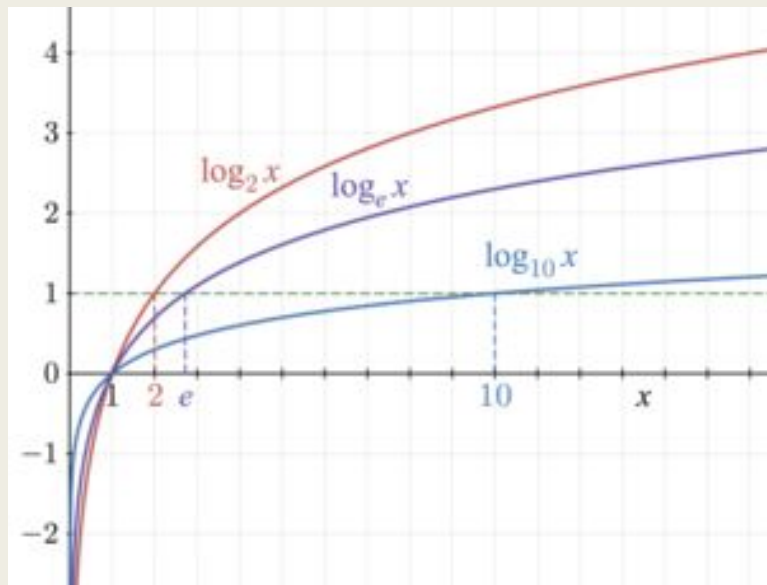


# Graphing Logarithmic Functions

Step 1: Find your first two points by taking the first two coordinates of an exponential function and flipping them.  $(0,1), (1,b) \rightarrow (1,0), (b,1)$

Step 2: Identify that the horizontal asymptotes becomes a vertical one

Step 3: Apply Transformations



# Basic Properties of Logarithms

## Product Property

If  $a$ ,  $m$  and  $n$  are positive integers and  $a \neq 1$ , then;

$$\log_a(mn) = \log_a m + \log_a n$$

## Quotient Property

If  $m$ ,  $n$  and  $a$  are positive integers and  $a \neq 1$ , then;

$$\log_a(m/n) = \log_a m - \log_a n$$

## Power rule

If  $a$  and  $m$  are positive numbers,  $a \neq 1$  and  $n$  is a real number, then;

$$\log_a m^n = n \log_a m$$

# Condensing Equations

While using the properties of logarithmic functions, you will see long functions and a few questions will ask you to condense them. A tip I would use for this procedure is use the Power Rule first before any other functions.

Example:

$$4 \ln x + 2 \ln y - 3 \ln(z + 2)$$

# Expanding Equations

On the opposite side of questions asked, you will also be asked to expand equations. A tip I would have for problems like this is look at using product rule when dealing with a fraction within a log. Function. Also do not forget power rules!

$$\log \left[ \frac{(5xy)^2}{3w^3z^3} \right]$$