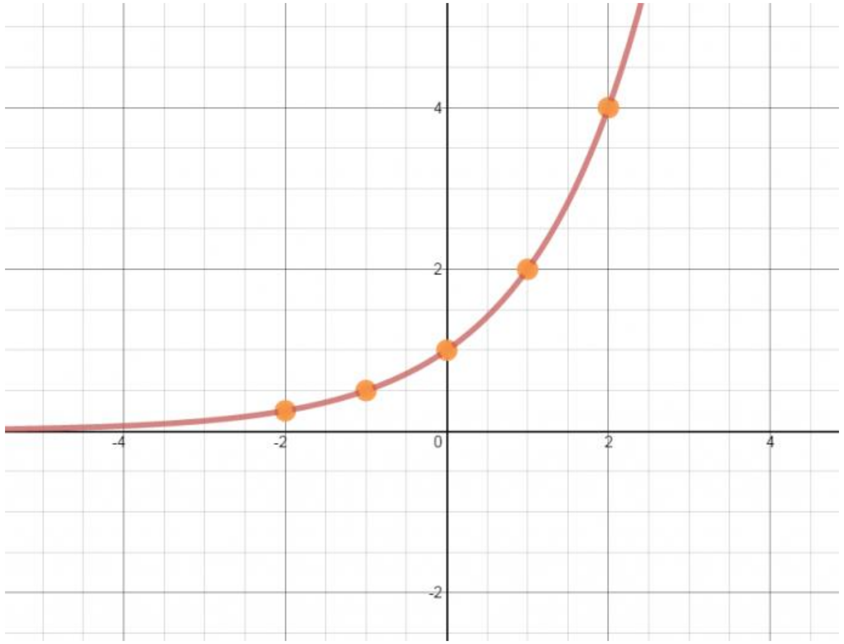
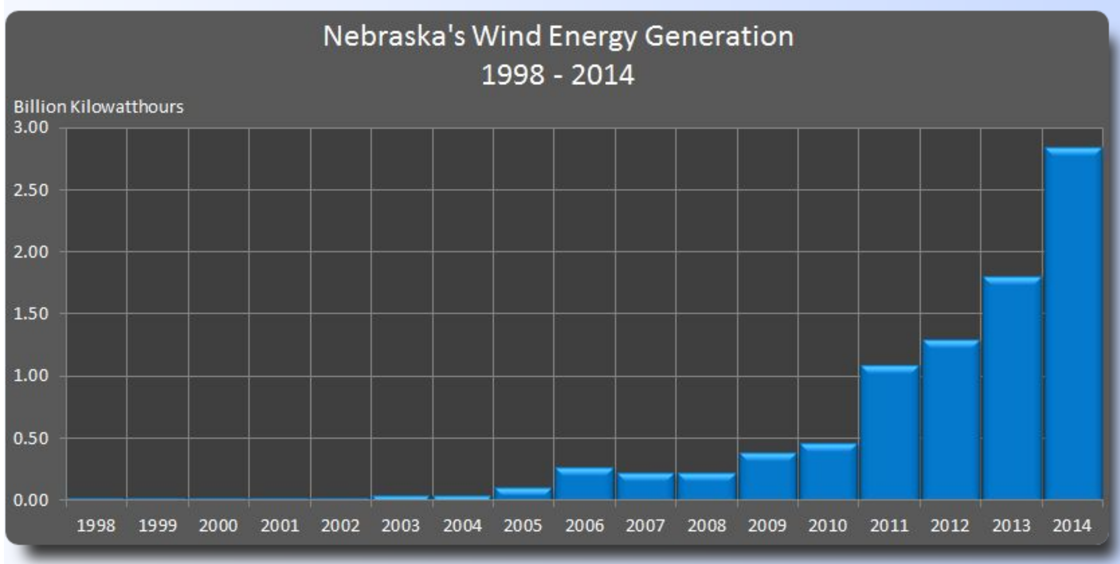
Exponential Functions and Their Graphs

Section 3.1





Exponential Function

A function in which the variable is an exponent

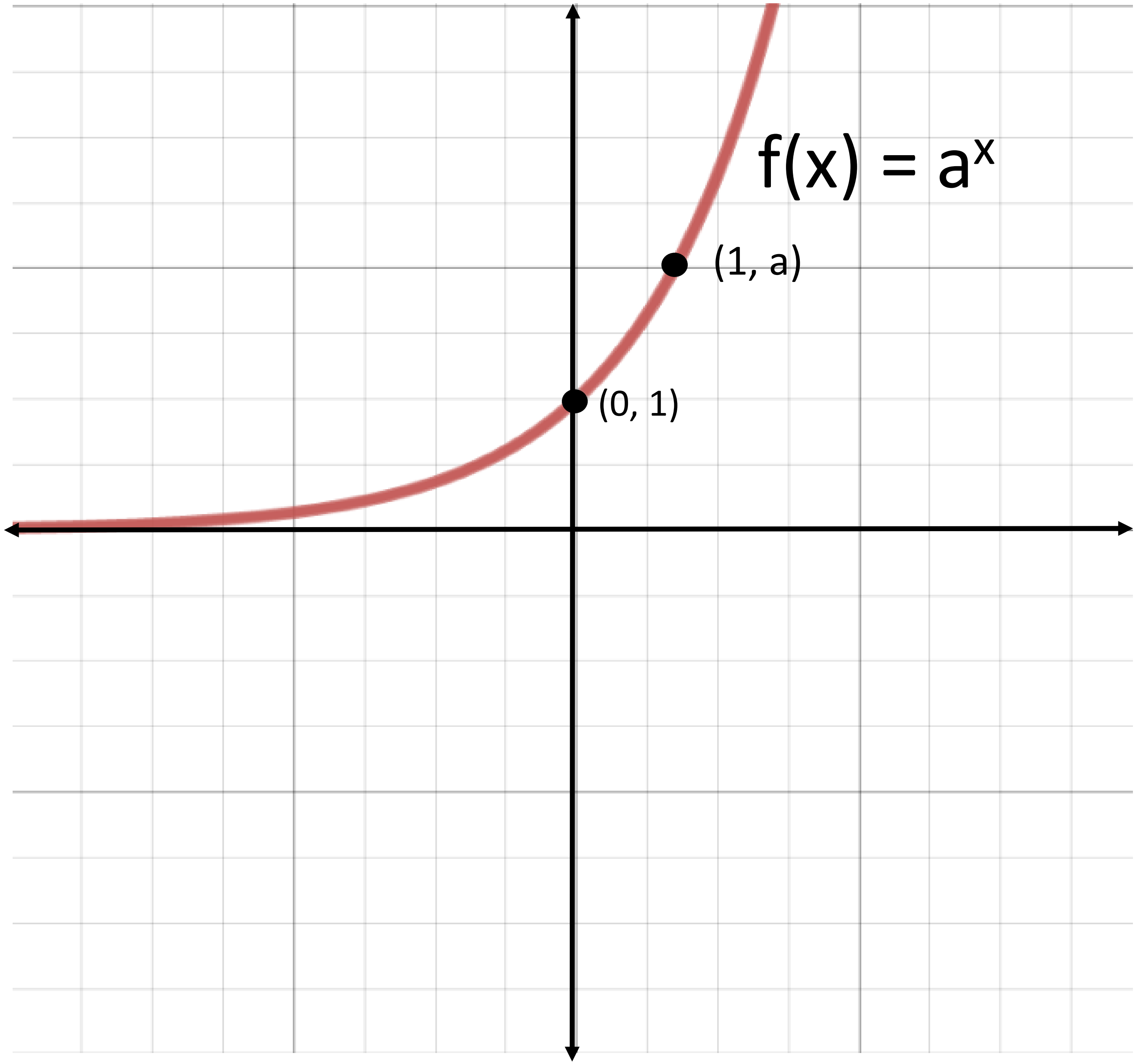
$f(x) = a^x$ where $a > 0$ (and $\neq 1$)

Examples:

$f(x) = 3^x$

$f(x) = \frac{1}{2}^x$

$f(x) = .8^x$



Domain: $(-\infty, \infty)$ $\mathbb{R}$

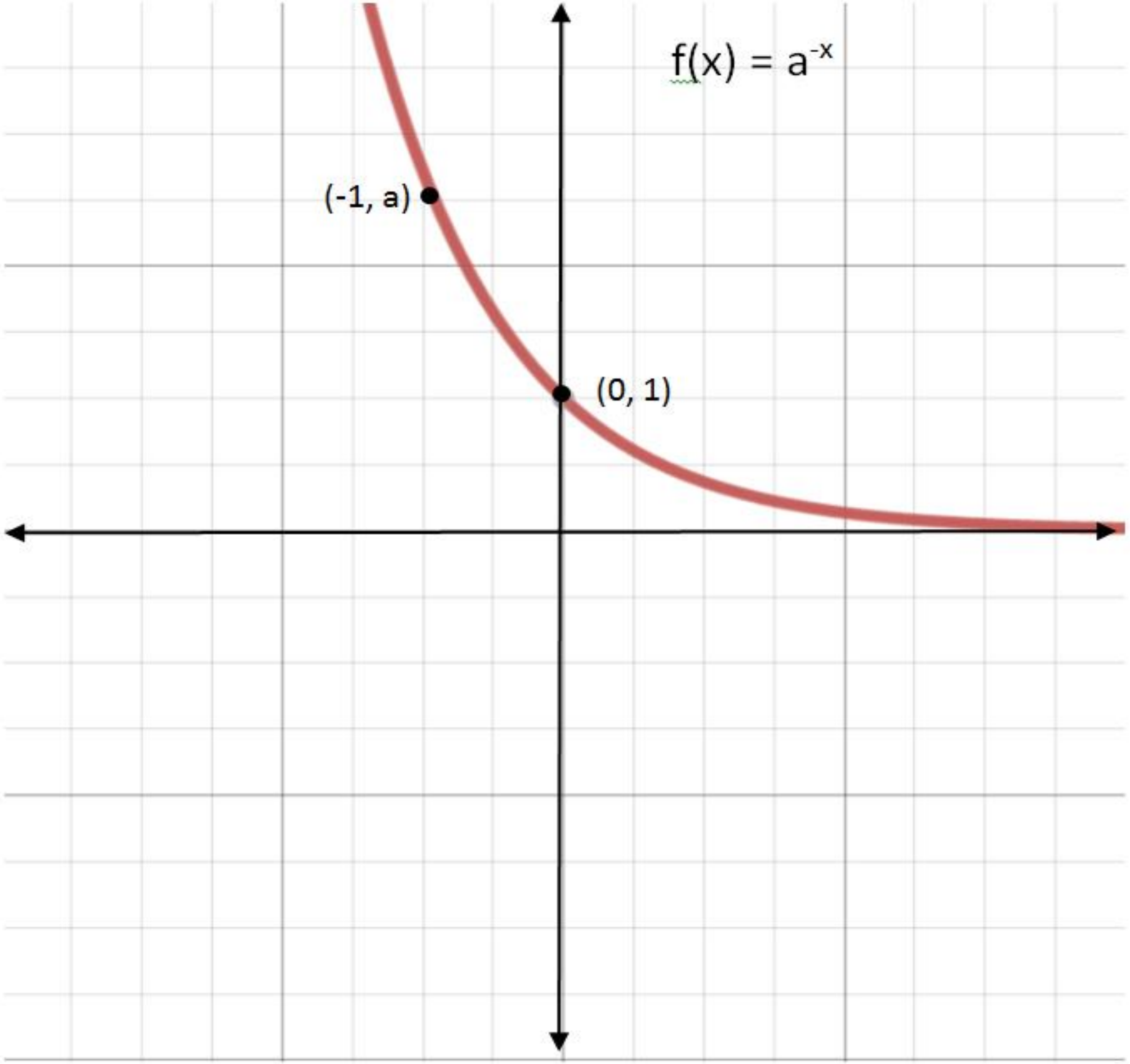
Range: $(0, \infty)$ $\mathbb{R}$ st $y > 0$

Increasing: $(-\infty, \infty)$

Decreasing: ____

y-intercept $(0, 1)$

$f(x) = a^{-x}$ + k



Domain: ℝ $(-\infty, \infty)$

Range: ℝ st $y > 0$ $(0, \infty)$

Increasing: ———

Decreasing: $(-\infty, \infty)$

y-intercept $(0, 1)$

desmos

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Families of Graphs

f(x) = a (x – h) + k

a – stretch (amplitude)

h – horizontal movement

k – verti*k*al movement

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e - Euler's Number, Napier's Constant, the Natural Base

$e \approx 2.718281$

e is the base in the natural log noted as ln

So $\ln = \log_e \approx \log_{2.718}$

Compound Interest

Compound n times/year

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

A = Amount earned/loaned over time

P = principle - amt. invested/loaned

n = no. of times interest is calc.

r = rate as a decimal

t = time

Continuously Compound

A = Pe^{rt}

A =

P =

r =

t =

A Comparison

If you loaned a bank $10,000 at a 6% interest rate for 10 years, find out the amount you would have in the bank if it is compounded:

Monthly

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

$$A = 10000\left(1+\frac{.06}{12}\right)^{(12)(10)}$$

$$10000(1+.005)^{120}$$

$$(10{,}000)(1.005)^{120}$$

18,193.97

Continuously

$$A = Pe^{rt}$$

$$A = 10{,}000e^{.6}$$

18,221.19

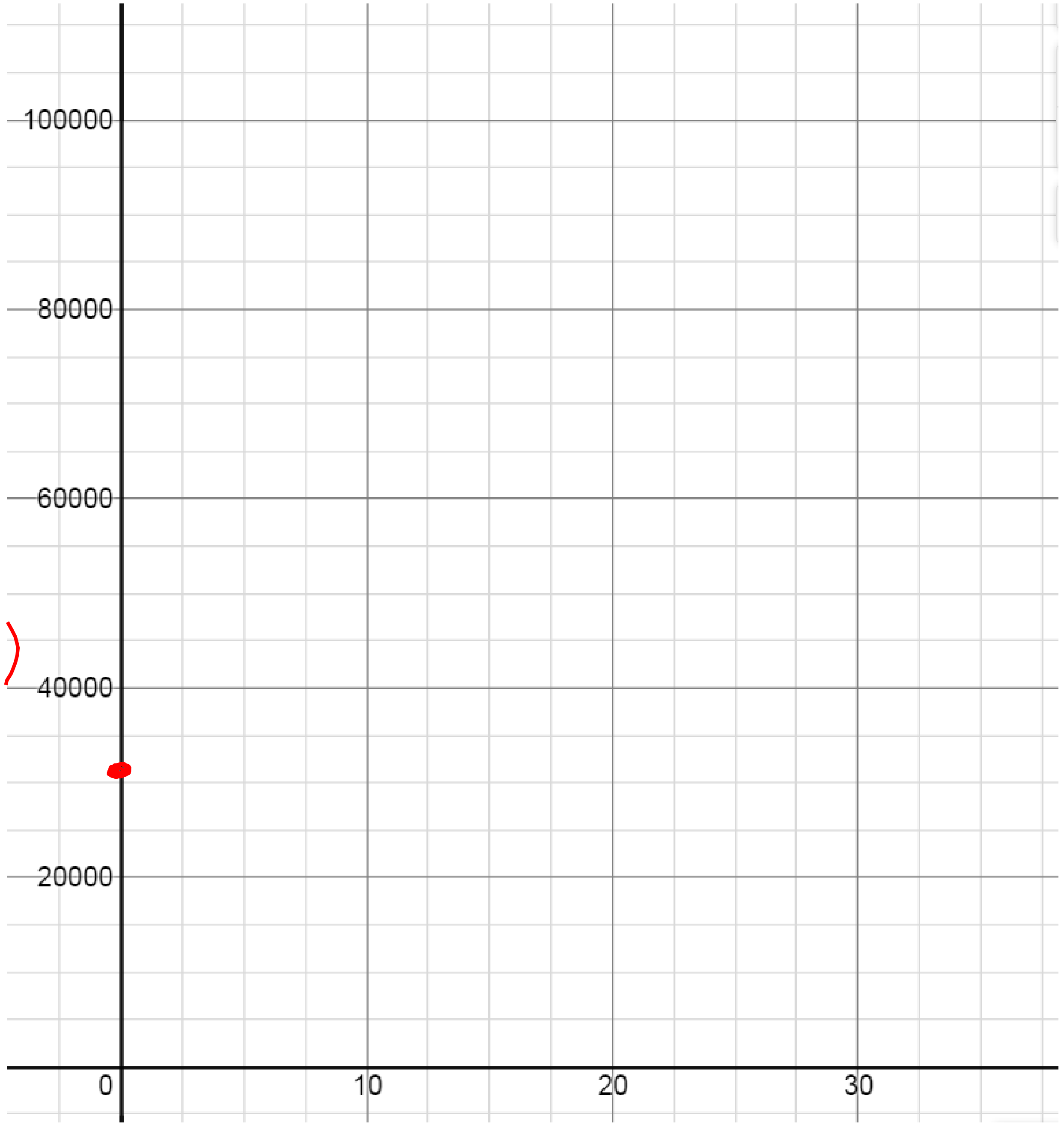
Population Growth

The population of a city increases according to the model $P(t) = 32{,}000e^{0.0367t}$ where t=0 corresponds to 1980. Graph this model and then use it to predict the population in 2008.

$32{,}000e^{.0367(10)}$ $(10, \quad)$

$32{,}000e^{.0367(20)}$

$32{,}000e^{.0367(28)}$



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Where do these equations come from?

Nebraska Wind Energy